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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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VOLUME 20 NUMBER 4 FEBRUARY 23, 1982

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) 431

02 AERODYNAMICS 439

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*

03 AIR TRANSPORTATION AND SAFETY 444

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION N.A.

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications.*

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 446

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

06 AIRCRAFT INSTRUMENTATION 447

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

07 AIRCRAFT PROPULSION AND POWER 448

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

08 AIRCRAFT STABILITY AND CONTROL 449

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

09 RESEARCH AND SUPPORT FACILITIES (AIR) 450

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*

12 ASTRONAUTICS (GENERAL) 451

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

13 ASTRODYNAMICS 451

Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) N.A.

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air).*

15 LAUNCH VEHICLES AND SPACE VEHICLES 452

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION N.A.

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

17 SPACECRAFT COMMUNICATION, COMMAND AND TRACKING 452

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 453

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

19 SPACECRAFT INSTRUMENTATION 453

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

20 SPACECRAFT PROPULSION AND POWER N.A.

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

23 CHEMISTRY AND MATERIALS (GENERAL) 453
Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 454
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 454
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics.*

26 METALLIC MATERIALS 459
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 463
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 464
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

ENGINEERING

Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
For related information see also *Physics.*

31 ENGINEERING (GENERAL) 466
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 470
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

33 ELECTRONICS AND ELECTRICAL ENGINEERING 477
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

34 FLUID MECHANICS AND HEAT TRANSFER 481
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 INSTRUMENTATION AND PHOTOGRAPHY 486
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation.*

36 LASERS AND MASERS 487
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 489
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 490
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 491
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.
For related information see also *Space Sciences.*

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES 495
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography.*

44 ENERGY PRODUCTION AND CONVERSION 498
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

45 ENVIRONMENT POLLUTION 506
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 510
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation.*

47 METEOROLOGY AND CLIMATOLOGY 515
Includes weather forecasting and modification.

48 OCEANOGRAPHY 517
Includes biological, dynamic and physical oceanography; and marine resources.

LIFE SCIENCES

Includes sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) 518
Includes genetics.

52 AEROSPACE MEDICINE 518
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES N.A.
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 520
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY N.A.
Includes exobiology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) 529

60 COMPUTER OPERATIONS AND HARDWARE 530
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

61 COMPUTER PROGRAMMING AND SOFTWARE 533
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS N.A.
Includes computer networks.

63 CYBERNETICS 537
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

64 NUMERICAL ANALYSIS 537
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY 540
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 542
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS 542
Includes topology and number theory.

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also *Engineering.*

70 PHYSICS (GENERAL) 543
For geophysics see *46 Geophysics.* For astrophysics see *90 Astrophysics.* For solar physics see *92 Solar Physics.*

71 ACOUSTICS 543
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS 545
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 549
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS 549
Includes light phenomena.

75 PLASMA PHYSICS 552
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS 556
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS 562
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) N.A.
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT N.A.
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 563
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS 564
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 564
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 565
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 571
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 571
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 572
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION N.A.
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

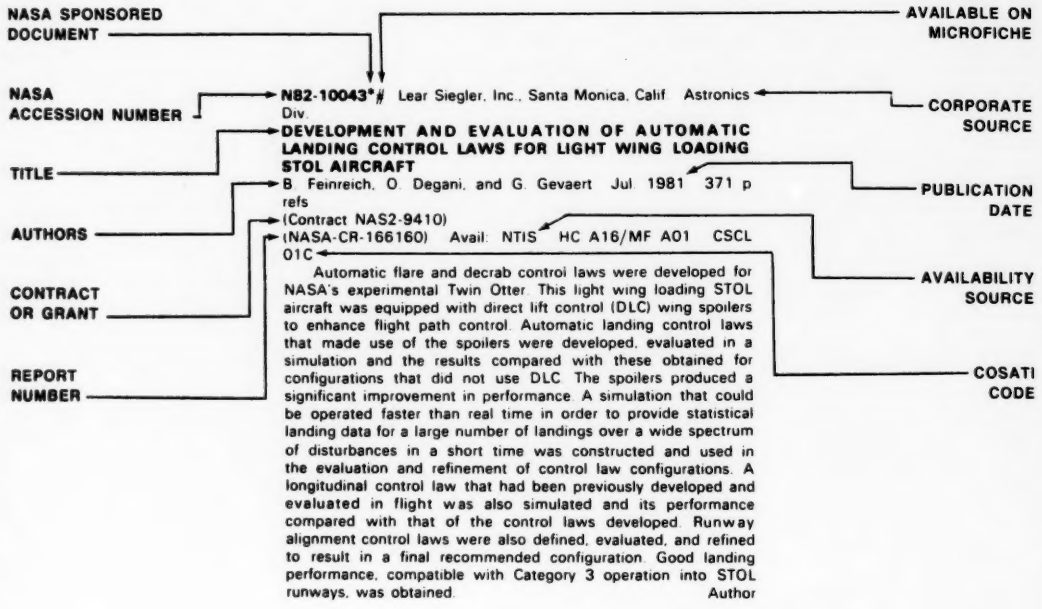
GENERAL

99 GENERAL 573

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-65
CORPORATE SOURCE INDEX I-73
CONTRACT NUMBER INDEX I-87
REPORT / ACCESSION NUMBER INDEX I-89

TYPICAL CITATION AND ABSTRACT


NASA SPONSORED DOCUMENT
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NASA ACCESSION NUMBER
N82-10043*# Lear Siegler, Inc., Santa Monica, Calif. Astronics Div.
CORPORATE SOURCE
TITLE
DEVELOPMENT AND EVALUATION OF AUTOMATIC LANDING CONTROL LAWS FOR LIGHT WING LOADING STOL AIRCRAFT
PUBLICATION DATE
AUTHORS
B. Feinreich, O. Degani, and G. Gevaert Jul. 1981 371 p refs
CONTRACT OR GRANT
(Contract NAS2-9410)
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REPORT NUMBER
(NASA-CR-166160) Avail: NTIS HC A16/MF A01 CSCL 01C
COSATI CODE
Automatic flare and decrab control laws were developed for NASA's experimental Twin Otter. This light wing loading STOL aircraft was equipped with direct lift control (DLC) wing spoilers to enhance flight path control. Automatic landing control laws that made use of the spoilers were developed, evaluated in a simulation and the results compared with these obtained for configurations that did not use DLC. The spoilers produced a significant improvement in performance. A simulation that could be operated faster than real time in order to provide statistical landing data for a large number of landings over a wide spectrum of disturbances in a short time was constructed and used in the evaluation and refinement of control law configurations. A longitudinal control law that had been previously developed and evaluated in flight was also simulated and its performance compared with that of the control laws developed. Runway alignment control laws were also defined, evaluated, and refined to result in a final recommended configuration. Good landing performance, compatible with Category 3 operation into STOL runways, was obtained. Author

VOLUME 20 NUMBER 4/FEBRUARY 23, 1982

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N82-13044* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 140
Oct. 1981 118 p
(NASA-SP-7037(140)) Avail: NTIS HC $5.00 CSCL 01A

This bibliography lists 386 reports, articles, and other documents introduced into the NASA scientific and technical information system in September 1981. A.R.H.

N82-13045*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN APPROXIMATE ANALYTICAL METHOD FOR VORTEX-LIFT AND CENTER OF PRESSURE ON THE SLENDER WING
Yin Xieyuan (Science and Technology Univ. of China) Dec. 1981 12 p refs Transl. into ENGLISH from Acta Aeron. et Astronautica Sinica (China), v. 1, no. 1, 1980 p 1-6
(NASA-TM-83198; L-14848) Avail: NTIS HC A02/MF A01 CSCL 01B

A simplified approximate analytical method for predicting vortex lift and center of pressure on slender wings is presented. Two empirical corrections are proposed. The method is compared with experimental data and gives accurate estimates. E.A.K.

N82-13046*# Nielsen Engineering and Research, Inc., Mountain View, Calif.
CONSOLIDATION OF DATA BASE FOR ARMY GENERALIZED MISSILE MODEL Final Report
Daniel J. Klenke and Michael J. Hemsch Aug. 1980 101 p refs
(Contract NAS2-10081).
(NASA-CR-166273; NEAR-TR-221) Avail: NTIS HC A06/MF A01 CSCL 01B

Data from plume interaction tests, nose mounted canard configuration tests, and high angle of attack tests on the Army Generalized Missile model are consolidated in a computer program which makes them readily accessible for plotting, listing, and evaluation. The program is written in FORTRAN and will run on an ordinary minicomputer. It has the capability of retrieving any coefficient from the existing DATAMAN tapes and displaying it in tabular or plotted form. Comparisons of data taken in several wind tunnels and of data with the predictions of Program MISSILE2 are also presented. S.L.

N82-13047*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WIND-TUNNEL INVESTIGATION OF THE TAIL-SPOILER CONCEPT FOR STALL-PREVENTION ON GENERAL AVIATION AIRPLANES
Dale R. Satran Nov. 1981 40 p refs
(NASA-TM-83208; L-14703) Avail: NTIS HC A03/MF A01 CSCL 01B

The longitudinal aerodynamic characteristics of a full scale, single engine general aviation airplane equipped with an angle of attack limiting concept which used a tail mounted spoiler for stall prevention were investigated. The tail spoiler was deployed as a nonlinear function of changes in angle of attack in a narrow angle of attack range immediately preceding the stall angle. Spoiler deployment produced a nose down moment which limited the nose up trim capability of the elevator to an angle of attack below the stall angle of the airplane. The tail spoiler system produced significant increases in longitudinal stability and elevator hinge moments near the stall. The effects of power, flaps, and center of gravity position are also studied. E.A.K.

N82-13048# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
THE IMPACT OF NEW GUIDANCE AND CONTROL SYSTEMS ON MILITARY AIRCRAFT COCKPIT DESIGN
Aug. 1981 217 p refs In ENGLISH; partly in FRENCH Symp. held in Bad-Cannstatt, West Germany, 5-8 May 1981
(AGARD-CP-312; ISBN-92-835-0297-3) HC A10/MF A01

The requirements and technologies involved in control systems were reviewed. Topics incude: displays; controls/displays system integration; automated systems/man interface; and cockpit systems evaluation. Emphasis is placed on the design of a cockpit layout with controls and displays that maximize the overall aircraft capability while keeping the pilot's workload within bounds by the use of more automation of system management. For individual titles, see N82-13049 through N82-13064.

N82-13049# Textron Bell Helicopter, Fort Worth, Tex. Human Factors and Cockpit Arrangement Group.
HOW THE HELICOPTER COCKPIT DESIGNER USES DIGITAL AVIONICS **c06**
John H. Emery *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 13 p ref (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

An overview of the approaches to helicopter cockpit design made possible through the application of advanced multiplex technology to cockpit displays and controls is presented. This technology enables the pilot to have more information available while, at the same time, reducing his workload, and provides for substantially improved cockpit management. One of the major research programs through which this technology was tailored for military helicopters is ADAS (Army Digital Avionics System). This program is discussed, along with Bell helicopter cockpit designs. T.M.

N82-13050# Smiths Industries Ltd., Bishops Cleeve (England). Aerospace and Defense Systems.
ELECTRONIC FLIGHT DECK DISPLAYS FOR MILITARY TRANSPORT AIRCRAFT **c06**
R. A. Chorley *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 12 p refs (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

These display systems offer operational and economic advantages which can be realized in military as well as in civil

aircraft. In particular, the flexibility of the display formats which can be provided, and the ease with which the information content can be changed, enable all the information required for the control of a transport aircraft to be displayed on the main panel, and go a long way towards making operation by a two-man crew possible. In addition, the flexibility of an electronic display system makes it feasible to minimize the effect of failures witin the display system to an extent which is impossible in the case of conventional instruments. Full realization of this capability, which calls for careful selection of the system architecture to be employed, may lead to a significant in mission success. A discussion of CRT displays is presented. T.M.

N82-13051# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Directorate of Avionics Engineering.

COLOR CRT DISPLAYS FOR THE COCKPIT c06

Harry L. Waruszewski *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 22 p refs (For primary document see N82-13048 04-01)

Avail: NTIS HC A10/MF A01

Color displays are currently being proposed for installation or are being installed in civilian and military aircraft cockpits. The complexity of designing a good color display is much greater than that of a monochromatic display. The human factors data and cockpit requirements needed to develop color cockpit displays so that requirements for a usable display can be generated are discussed. The color display technology was evaluated with respect to satisfying the established human factors requirements. Test methodologies need to be developed to determine compliance of the color displays to the specification requirement. Finally, the need for displays to be integrated into the cockpit using total cockpit human factors criteria to maximize the possible workload reduction and safety of the aircraft is discussed. T.M.

N82-13052# Thomson-CSF, Paris (France).

HEAD UP DISPLAYS c06

Claude Maureau *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 7 p (For primary document see N82-13048 04-01)

Avail: NTIS HC A10/MF A01

The displays present information to pilots without depriving them of a simultaneous external view. This implies that head-up dispdisplays are collimated displays. The problems involved with collimation are discussed and the possibility of head-up providing pilots with directional information is considered. T.M.

N82-13053# Army Avionics Research and Development Activity, Fort Monmouth, N. J.

INTEGRATION OF CONTROLS AND DISPLAYS IN US ARMY HELICOPTER COCKPITS c08

J. A. Dasaro and C. T. Elliott *In* AGARD The Impacts of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 19 p refs (For primary document see N82-13048 04-01)

Avail: NTIS HC A10/MF A01

Expanded missions such as anti-armor, night surveillance, and air-to-air, coupled with the survivability requirement of nap-of-the-Earth flight, dictate the approach to cockpit design. This approach must apply the latest technological innovations in the areas of controls, displays multiplexing, and microprocessors to unburden the pilot. Space, weight, and cost constraints placed on the cockpit system designers must also be satisfied. The U.S. Army completed a full scale engineering development program in the area of cockpit integration, and is currently involved in a more ambitious exploratory development effort. An overview of these efforts to integrate the helicopter cockpit, including results of similation experiments and operational flight tests, is presented. T.M.

N82-13054# Collins Radio Co., Cedar Rapids, Iowa. Government Avionics Div.

A STANDARD CONTROL DISPLAY UNIT FOR MULTI-AIRCRAFT APPLICATION c06

Ronald L. Swanson and Craig R. Scougton *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 10 p (For primary document see N82-13048 04-01)

Avail: NTIS HC A10/MF A01

The need for standardization of military hardware is well documented both within the US DOD and NATO. Standardization issues revolve mainly around interoperability, logistics, and life-cycle cost advantages. The issue of standardization and its suitability in the design of aircraft control/display units (CDU) is addressed. Potential benefits, requirements, and remaining problems associated with standardization of avionics control displays are discussed. Included is a discussion of a CDU that is currently being produced which has many of the features considered essential to the ultimate standard CDU. T.M.

N82-13055# British Aerospace Aircraft Group, Preston (England). Military Aircraft Div.

DEVELOPMENT OF A MINIATURISED DIGITAL THRUST DEMAND UNIT c07

Arthur Kaye *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 10 p (For primary document see N82-13048 04-01)

Avail: NTIS HC A10/MF A01

Present generation analogue units were analyzed in order to produce design for the line replaceable units (L.R.U.S.). The elimination of the motion conversion chain, linear to angular, angular to linear is shown to afford significant savings in weight and volume. Angular motion and compliant force throttles, while creating maximum space saving, are shown to be ergonomically inferior to a linear input. An explanation of the operating principles of the linear stepper motor chosen as the auto-pilot prime mover is given with both the inherent advantages and disadvantages used to good effect in the overall design. Digital position encoding completes the design of the prototype unit and the results to date of the testing of this unit are given with recommendations for the design of a production unit. T.M.

N82-13056# Crouzet Aerospace and Systems, Valence (France).

USING VOICE CONTROL ONBOARD COMBAT AIRCRAFT [UTILISATION DE LA COMMANDE VOCALE A BORD DES AERONEFS DE COMBAT] c06

J. R. Coster and J. M. Melocco *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpits Design Aug. 1981 5 p In FRENCH (For primary document see N82-13048 04-01)

Avail: NTIS HC A10/MF A01

The use of the voice would be a valuable tool in resolving problems associated with pilot workload, in reducing the surface of the flight instrument system and the complexity of the man machine interface in high performance combat aircraft. A program established at the Laboratory of information for Mechanics and Engineering Sciences validates in aircraft environments the methods of speech recognition and synthesis developed in research laboratories. It is merely a matter of the universal recognition, at the acoustic level of isolated words pronounced by a single speaker. The techniques used are described. These include laboratory experiments involving an aeronautical dialog in a noisy environment and experimentation with a simulator of a vocal dialog applied to an aircraft with modern weapons and to the study of human factors. Experimentation also takes place in a flight simulator. Transl. by A.R.H.

N82-13057# Smiths Industries Ltd., Bishops Cleeve (England). Aerospace and Defence Systems.

COMMAND-RESPONSE DATA TRANSMISION TO MECHANICAL SYSTEMS MANAGEMENT EFFECT ON THE CREW/SYSTEM INTERFACE c05

I. Moir (British Aerospace Aircraft Group), C. Moxey, and P. A. Lancaster (British Aerospace Aircraft Group) *In*AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 12 p (For primary document see N82-13048 04-01)

Avail: NTIS HC A10/MF A01

The availability of low cost, high reliability micro-electronic digital devices digital data transmission systems an attractive proposition for aircraft data handling systems. Apart from the advantages of accuracy and high data rates which digital devices offer, significant improvements in system performance, weight and reliability are possible. Initially the use of digital data system was confined to aircraft avionics systems embracing navigation, weapon aiming and flight control functions. More recently the application techniques extended to the centralized control of

mechanical system management. A example of an engine failure and shut-down in flight is given to demonstrate the interactive nature of data handling between two data buses and the effects upon advanced cockpit displays. A.R.H.

N82-13058# Naval Air Development Center, Warminster, Pa.
THE INTELLIGENT USE OF INTELLIGENT SYSTEMS: PROBLEMS IN ENGINEERING MAN/MACHINE SYMBLOSIS **c54**
J. Hopson, W. Zachary (Analytics, Inc., Willow Grove, Pa.), and N. Lane *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 16 p refs (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

A methodology to structure the process of designing 'intelligent systems' was generated in the course of several specific projects undertaken to develop such systems for a variety of airborne platforms. The general goals of these projects are to improve system performance by enhancing the effectiveness of information management within the total avionics systems. Results from the studies are summarized and the knowledge gained is related to a systematic design/evaluation approach. A.R.H.

N82-13059# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France).
MONOCULAR VISION AND TACTICAL FLIGHT ON THE HELICOPTER [VISION MONOCULAIRE ET VOL TACTIQUE SUR HELICOPTERE] **c06**
J. P. Papin, J. P. Menu, and G. Santucci *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 14 p refs In FRENCH (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

The direction of eye movement of 7 pilots and 3 navigators was recorded in 8 hour helicopter flight during flight with obstacle missions. Each subject performed the mission while having variable conditions of monocular or binocular vision, with normal visual field or with the field reduced from 60 deg to 40 deg. Analysis of visual behavior concentrated on localization of viewing in relation to the cockpit and the object looked at. The localizations were analyzed in terms of passage from one object to another or m one zone to another in terms of the number of stops in different localizations and in terms of the total duration or method of the stops. Results show that (1) for a given condition, the subjects reacted in a relatively similar manner; (2) behavior was modified according to condition of vision: ths more the field was reduced, the more the pilot increased his field of exploration and looked closer to the apparatus and to the instruments; (3) during stationary flights the behavior modification became amplified; and (4) monocular vision is more degrading of behavior reduction of the visual field. Transl. by A.R.H.

N82-13060# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.
EXPERIMENTAL INVESTIGATION OF A HELMET MOUNTED SIGHT/DISPLAY FOR HELICOPTER **c06**
R. Beyer, E. Danneberg, E. Kohnen, and H. Stein *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 11 p (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

A helmet mounted sight/display (HMS/D) combined with an infrared camera and electronic instrument displays was investigated as a guidance aid for the low level flight of helicopters at night. The static and dynamic accuracy of the tracking mechanism which aligns the lines of sight of both the pilot and the camera was determined by means of a target and motion simulator. System performance was checked with a Bo 105 helicopter in low level flight at night. From the results obtained the importance of the HMS/D as an guidance aid becomes evident relative to other night vision/display systems. Author

N82-13061# Royal Aircraft Establishment, Farnborough (England). Flight Systems Dept.
USE OF A HELMET-MOUNTED MATRIX DISPLAY FOR PRESENTING ENERGY-MANEUVERABILITY INFORMATION DURING SIMULATED CLOSE COMBAT **c06**
D. N. Jarrett *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 10 p refs (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

Since continuous visual contact display (HMMD) with the enemy is essential in close combat the provision of this information on a helmet-mounted diplay (HMMD) may be particularly useful. However, the (in) visibility of the image against a bright sky background, the increased helmet weight and other inconveniencing counter effects when coupled with the high attentional and physical demands of combat, may obviate any advantages of controlling the aircraft using the extra information. A series of exercises was set up to assess the HMMD in this application. The device was the subject of a flight trial in a light jet aircraft, and two studies were completed in the newly-commissioned RAE air combat simulator. These studies enabled pilots to become familiar with the device and the unusual display format, in order to assess their combined usefulness in a combat context. A.R.H.

N82-13062# Naval Air Test Center, Patuxent River, Md.
EVALUATION OF A PILOT WORKLOAD ASSESSMENT DEVICE TO TEST ALTERNATE DISPLAY FORMATS AND CONTROL HANDLING QUALITIES **c54**
Samuel G. Schiflett, Paul M. Linton (Naval Air Development Center, Warminster, Pa.), and Ronald J. Spicuzza (Systems Research Labs., Inc., Dayton, Ohio) *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 12 p refs (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

The utility of a workload assessment device to measure pilot workload for approach and landing formats and control stability variations was tested in in a modified NT-33 research aircraft. The feasibility of using an item-recognition task as a measure of sensory-response loading and reserve information processing capacity while flying precision approaches was established. Statistical treatment of the data indicates an appreciable increase in reaction time and errors with degraded handling qualities as compared to ground baseline measures and good handling qualities. The preliminary findings also reveal consistent trends toward the availability of more mental reserve capacity when flying predominantly pictorial/symbolic HUD configurations as compared to conventional HUD formats with scales and alphanumerics. A.R.H.

N82-13063# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
TANKER AVIONICS AND AIRCREW COMPLEMENT EVALUATION **c06**
Richard W. Moss and Gregory J. Barbato (Bunker-Ramo Corp., Dayton, Ohio) *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 18 p refs (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

A four phase effort addressing the control and display design issues associated with operating the SAC'S KC-135 tanker without the navigator crew position is discussed. Topics covered include the mission analysis phase during which the tanker's operational responsibilities were defined and documented; the design phase durng which alternative crew station design concepts were developed; the mockup evaluation phase which accomplished initial SAC crewmember assessment of cockpit designs; and the simulation phase which validated the usability of the crew system redesign. A recommended crew station configuration is examined and some of the philosophy underlying the selection of cockpit hardware and systems is discussed. A.R.H.

N82-13064# McDonnell Aircraft Co., St. Louis, Mo.
F/A 18 HORNET CREW STATION **c05**
Eugene C. Adam *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 6 p (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

The Hornet crew station design requirement was to essentially provide the capability contained in both the F-4 and A-7 weapon systems so as to perform both the fighter attack roles, make it

operable by one pilot, and increase mission reliability by a combination of improved hardware reliability and functional redundancy. To put this requirement in perspective, the F/A-18 cockpit has 40% less usable area than any of its contemporaries. This area constraint necessitated extensive integration of the weapon system controls and displays. The resultant crew station features four miltipurpose cathoderay displays driven by two mission computers, an integrated upfront control panel, and numerous automatic functions on the stick and throttle. The rationale leading up to the configuration is described and a few examples of the one-man-operability features of the Hornet and how they would used by the pilot are presented. A.R.H.

N82-13065# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

AERODYNAMICS OF POWER PLANT INSTALLATION

Sep. 1981 510 p refs In ENGLISH and FRENCH Proc. of conf. held in Toulouse, 11-14 May 1981

(AGARD-CP-301; ISBN-92-835-0301-5) Avail: NTIS HC A22/MF A01

The aerodynamic problems in power plant installation are surveyed and computational and design methodologies are presented. Combat aircraft intakes, afterbodies and nozzles, testing and analysis techniques, and installation aerodynamics of transport aircraft are addressed. For individual titles, see N82-13066 through N82-13098.

N82-13066# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

PERFORMANCE OF HIGHLY INTEGRATED INLETS FOR SUPERSONIC AIRCRAFT **c02**

Lewis Surber, Jan Syberg, and Joseph Koncsek *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 12 p refs Prepared in cooperation with Boeing Military Airplane Co., Seattle (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01

Performance data obtained on several subsonic diffusers applicable to advanced supersonic tactical aircraft configurations were used to select a forebody-inlet model for proof-of-concept wind tunnel performance evaluation. Three of the diffusers were designed for high aspect ratio inlets having throat aspect ratios greater than seven. A fourth design incorporated a low aspect ratio inlet. Two of the high aspect ratio diffusers and the low aspect ratio diffuser incorporated duct bends typical of inlets substantially offset from the engine centerline. Preliminary tests of the high aspect of ratio diffuser produced high total pressure recovery coupled with relatively low flow distortion. Furthermore, the use of longitudinal vanes in one high aspect ratio diffuser provided reductions in engine face flow distortion with very little performance degradation. Proof-of-concept tests further investigated the performance of a high aspect ratio, side-mounted external compression supersonic inlet. Tests were performed in a 16-foot supersonic propulsion wind tunnel at Mach numbers of 1.6 to 2.2 over a -5 to 12 deg angle of attack range and sideslip angles from -8 to +8 deg. The results of these tests support the use of high aspect ratio inlets with sharp duct bends as a viable design option in future supersonic aircraft designs. M.G.

N82-13067*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

TOP-MOUNTED INLET SYSTEM FEASIBILITY FOR TRANSONIC-SUBSONIC FIGHTER AIRCRAFT APPLICATIONS **c02**

T. L. Williams, B. L. Hunt, D. B. Smeltzer, and W. P. Nelms *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 17 p refs Prepared in cooperation with Northrop Corp., Hawthorne, Calif. (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01 CSCL 01A

To inlet flow field and engine inlet performance data for an advanced fighter aircraft configuration were obtained over the Mach 0.6 to 2.0 range. The studies not only provided extensive data for the baseline arrangement, but also evaluated the effects of key aircraft configuration variables (inlet location, canopy-dorsal integration, wing leading-edge extension planform area, and variable incidence canards) on top inlet performance. In order to set these data in the context of practical aircraft systems top inlet performance is compared with that of more conventional inlet/airframe integrations. The results of these evaluations show that, for the top inlet configuration tested, relatively good inlet performance and compatibility characteristics are maintained during subsonic and transonic maneuver. However, at supersonic speeds, flow expansion over the forebody and wings causes an increase in local inlet Mach number subsequently reduces inlet performance levels. These characteristics infer that although top inlets many not pose a viable design option for aircraft requiring a high degree of supersonic maneuverability, they have distinct promise for vehicles with subsonic and transonic maneuver capabilities. M.G.

N82-13068# Royal Aircraft Establishment, Bedford (England). Aerodynamics Dept.

SOME RAE RESEARCH ON SHIELDED AND UNSHIELDED FUSELAGE MOUNTED AIR INTAKES AT SUBSONIC AND SUPERSONIC SPEEDS **c02**

J. A. Ross, I. McGregor, and A. J. Priest *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 16 p refs (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01

The incidence performance of fuselage-mounted intakes at subsonic and supersonic speeds is examined. The effects of simple changes in intake geometry, such as increasing contraction ratio and altering lower lip shape, are first considered; it is shown that such modifications can be beneficial at subsonic speeds, but drag penalties tend to limit their use at higher Mach numbers. Two intake locations that potentially offer a good degree of incidence shielding - underfuselage and understrake - are then examined. It is concluded that satisfactory performance can be obtained with an understrake installation, but a detailed study of strake shape, slots, splitter plates and boundary layer diverters must be made if the combinaion is to be successful over the whole of the intended flight envelope. However, for the configurations tested, the underfuselage location offers generally better intake performance lower technical risk. Finally, some results for a side-mounted staggered lip intake are presented, together with some two dimensional calculations of the mutual interference effects that occur between the upper and lower lips. It is suggested that an intake of this type can be competitive with an underfuselage installation. M.G.

N82-13069# National Gas Turbine Establishment, Pyestock (England).

PREDICTION AND MEASUREMENT OF TIME-VARIANT, THREE-DIMENSIONAL FLOWS IN MILITARY AIRCRAFT INTAKES **c02**

D. E. Colbourne and J. E. Flitcroft *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 18 p refs (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01

The development of a computational method suitable for predicting the three dimensional flows within the diffuser sections of aircraft intakes is described. A fast method for automatic grid generation, application to ducts of any smoothly varying cross-sectional shape, is discussed. The development of a finite-volume, time-marching method for solving the flow equations is also described. The validity of the chosen techniques is discussed in the light of comparisons with analytical and empirical results. Empirical techniques were developed to examine flows in which viscous or time variant effects are dominant. A rotating yaw meter rake was developed to undertake detailed flow surveys at the exit of model diffusers, and results may be obtained from tests both in isolation and in the presence of a compressor. The development of instrumentation and data processing facilities for measuring instantaneous engine face total pressure distortion in small scale models is also described, together with the validation of this technique by comparison with results from a full-size replica of the intake tested under free-jet conditions. M.G.

N82-13070# British Aerospace Aircraft Group, Bristol (England).

EFFECTS OF INTAKE GEOMETRY ON CIRCULAR PITOT INTAKE PERFORMANCE AT ZERO AND LOW FORWARD SPEEDS **c02**

A. C. Willmer, T. W. Brown, and E. L. Goldsmith (RAE, Bedford, England) *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 16 p refs Sponsored in part by Ministry of Defence (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01

A series of experiments on circular cross-section pitot intakes at Mach numbers from 0 to 0.21 and angles of incidence and sideslip from 0 to 40 deg are presented. Measurements were made at the engine face of 72 pitot pressures, 4 unsteady pitot pressures, swirl angle at six positions, and boundary layer profiles at four positions. Static pressure distribution around the cowl lips and along the diffusers were also measured. Five cowl lips covering a range of contraction ratios and lip shapes were tested with both a straight and an S bend diffuser. The effect of inserting parallel section spacers between the cowl lip and the front of the subsonic diffuser and between the end of the subsonic diffuser and the engine face instrumentation and the effect of a thin lip slot upstream of the intake throat were evaluated. Results indicate that, lip losses may be decreased by increasing contraction ratio, fitting a lip slot or a forward spacer. Steady state flow distortion at the engine face is decreased by increasing lip contraction ratio or by fitting an aft extension. For the S duct tested, distortion levels are set by the diffuser as much as by incidence. Sideslip, however, lessens the distortions. M.G.

N82-13071# Institut de Mecanique des Fluides de Lille (France).
TRANSONIC FLOWS IN AN AIR INLET WITH LARGE INCIDENCE AND THE EFFECT OF A BLOWING TRAP [ECOULEMENTS TRANSSONIQUES DANS UNE PRISE D'AIR EN GRANDE INCIDENCE AT EFFET DE TRAPPE DE SOUFFLAGE] **c02**
A. Dyment, P. Gryson, and J. P. Flodrops *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 13 p ref In FRENCH (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

Flow in a bidimensional air intake with large incidence was studied under conditions in which the upstream flow was subsonic and the internal flow could be regulated. The phenomena following flow separation were examined, especially the homogenization of the internal flow. A device for improving mogenization which involves a natural deflection accomplished by a scoop designed to guide the captivated air was tested. The universal aspect of internal flow was studied using probes in different sections. The unsteady phenomena were analyzed from ultra high speed visualizations and the mean flow was characterized from classic visualization. The insertion of the deflector appreciably improved the performance of the air intake. The coefficient of output (sigma) and the total mean pressure (P sub tm) were considerably improved at the level of the compressor. While the use of the scoop to guide the air towards the slot had only a weak influence on sigma and P sub tm at the compressor level, it brought an appreciable gain in the speed of homogenization of the internal flow. Transl. by A.R.H.

N82-13072# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Theoretical Aerodynamics Dept.
CALCULATION OF TRANSONIC AIR-INTAKES USING A COMPUTER PACKAGE FOR INVISCID AND BOUNDARY LAYER FLOWS **c02**
Ciro W. Lucchi *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 4 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

A finite-element method was developed to solve the full potential equation for transonic flows in a two dimensional engine intake. Since the full potential equation is expressed in the psi-formulation, a successive line over-relaxation algorithm was developed to solve the system of non-linear algebraic equations. Stability in the supersonic domain was obtained using Hafez's artificial compressibility method. Herring-Mellor's finite-difference code was incorporated to compute two dimensional compressible laminar-turbulent boundary layers. A fixed transition or Dunham's transition criterion may be chosen. The inviscid method was tested on a few single profiles, such cases having been computed exhibiting difficulties expected to occur in the calculation of two-dimensional intakes: high leading-edge suction peaks and strong shocks. Computations carried out on a two dimensional Tornado-like air-intake are discussed. A.R.H.

N82-13073# Aeritalia S.p.A., Torino (Italy). Combat Aircraft Group.
SUBSONIC MILITARY AIRCRAFT ENGINE INTAKE: AN INTEGRATED THEORETICAL EXPERIMENT DESIGN **c02**
G. Bertolone and L. Fornasier *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 17 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

Two numerical codes were developed for the simulation of the engine intake-induced flow field in two dimensional transonic and three dimensional subsonic cases. Both codes were obtained by modification of existing codes suitable for the computation of the exterior flow past airfoils (by a finite element method) and about three dimensional arbitrary configurations (by a panel method). Computed results and comparison with experimental data pertinent to the analysis of a single bifurcated intake proved usefulness of the present numerical schemes for engineering applications. Engine face auxiliary doors design and side intakes diverter shape optimization was studied. Following an extensive testing program performed on a static model, the engine face auxiliary doors with annular air admission into the primary long type duct appeared to be a good alternative to the classical solution placed at the main inlet entry. Diverter geometry influence both on aerodynamics, in terms of drag coefficient, and intake performance, in terms of distortion coefficient, was investigated by testing a low speed model. R.J.F.

N82-13074# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Flugzeuge.
THE DESIGN AND DEVELOPMENT OF THE TORNADO ENGINE AIR INTAKE **c05**
C. P. Stocks (British Aerospace, Warton, England) and N. C. Bissinger *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 21 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

The design and development of the Tornado aircraft supersonic intake is described. Critical aerodynamic design areas are outlined with special emphasis on compatibility. The intakes were designed to satisfy the conflicting requirements of greater than Mach 2 operation and a very wide incidence operating envelope at subsonic speeds. The problem of design loads is reviewed as well as the theory and operation of the automatic control system. Propulsion system behavior in flight and some examples of intake-airframe interaction are described. R.J.F.

N82-13075# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
INTEGRATION OF ADVANCED EXHAUST NOZZLES **c07**
Douglas L. Bowers and James A. Laughrey *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 14 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

Attributes of both axisymmetric and nonaxisymmetric advanced nozzles and their incorporation into an aircraft to improve cruise performance, maneuverability and short takeoff and landing operation are discussed. It was concluded that when used as a trimming device, advanced exhaust nozzles with thrust vectoring can provide significant aircraft cruise drag reduction. The aftbody/nozzle installation for advanced airframes and exhaust nozzles must be approached very carefully to demonstrate an installed drag benefit. For maneuver, advanced thrust vectoring exhaust nozzles show advantages at high angle of attack. Improved turn rate and instantaneous maneuver performance can be provided by utilizing these advanced exhaust nozzles in advanced aircraft. For short takeoff and landing aircraft advanced exhaust nozzles with both thrust vectoring and thrust reversing may be necessary. Thrust vectoring up to 60 degrees (or higher) and a propulsive lift control system may be required. R.J.F.

N82-13076# Rolls-Royce Ltd., Bristol (England). Installation Aerodynamics Group.
THE SUBSONIC PERFORMANCE OF PRACTICAL MILITARY VARIABLE AREA CONVERGENT NOZZLES **c07**
L. R. Harper IN AGARD Aerodyn. of Power Plant Installation Sep. 1981 11 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

Performance considerations involved in the selection of a variable area nozzle for reheated engines for combat aircraft are discussed. The main emphasis is on dry operation at subsonic speeds since drag, weight, leakage and other penalties in this

regime can prevent an aircraft attaining its design radius of action. Zero-base nozzles are compared with a moving shroud nozzle which has a substantial annular base area in dry setting. The moving shroud nozzle, as used on the RB199 engine in the Tornado MRCA, is very competitive with zero base nozzles in terms of overall performance. It is light, mechanically simple, reliable, and its short length permits a target type thrust reverser to be used. It is concluded that this type of nozzle is the optimum choice for combat aircraft until further technology advances permit substantial improvements in the overall performace of the more sophisticated nozzles. R.J.F.

N82-13077# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).

COMPARISON OF DIFFERENT NOZZLE CONCEPTS FOR A REHEATED TURBOFAN **c07**

H. Grieb, R. Vedova, H. Enderle, and H. Nagel *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 15 p refs Sponsored in part by German Ministry of Defence (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01

Several concepts of convergent and convergent/divergent nozzles are investigated and compared in view of performance, weight, complexity and the influence on afterbody drag of combat aircraft. The influence of different nozzle cooling concepts on thrust, with subsequent cooling air requirements, is investigated. The optimum ratio of exit area/throat area of convergent/divergent nozzles dependent on nozzle concept and nozzle pressure ratio is identified. The performance comparison shows that fully variable convergent/divergent nozzles promise some advantages against the simple convergent nozzle at high nozzle pressure ratios. However, the higher weight and complexity of convergent/divergent nozzles lead to the conclusion that the choice of convergent/divergent nozzles for reheated turbofan engines in combat aircraft is not generally justified. J.D.H.

N82-13078# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Aero Propulsion Lab.

ADVANCED EXHAUST NOZZLE TECHNOLOGY **c07**

Ronald J. Glidewell and Robert E. Warburton (Pratt and Whitney Aircraft Group, West Palm Beach, Fla.) *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 11 p refs (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01

Turbine engine exhaust nozzle technology, including nonaxisymmetric nozzles, thrust reversing, and thrust vectoring was investigated. Trade studies to determine the impact of these developments on the thrust-to-weight ratio and specific fuel consumption of an advanced high performance, augmented turbofan engine are reported. Results are presented in a manner which provides a understanding of the sources and magnitudes of differences in the basic elements of nozzle internal performance and weight as they relate to conventional axisymmetric nozzle technology. These comparisons are presented for three categories of nozzle functional capability: jet area and exit area control, thrust reversing, and thrust vectoring. J.D.H.

N82-13079# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

A NUMERICAL INVESTIGATION OF EXHAUST PLUME TEMPERATURE EFFECTS ON NONAXISYMMETRIC NOZZLE/AFTERBODY PERFORMANCE **c07**

K. M. Peery (Boeing Military Airplane Co., Seattle) and D. L. Russell *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 11 p refs (For primary document see N82-13065 04-01) (Contract F33615-79-C-3018)

Avail: NTIS HC A22/MF A01

A two dimensional Navier-Stokes flow analysis procedure is used to simulate the single expansion ramp nozzle (SERN) flow field in an attempt to understand the effect of exhaust total temperature on the nozzle flow field. Steady state solutions were obtained using an explicit time-dependent method utilizing efficiency-improvin techniques such as body-fitted mesh, coupled computational regions, wall functions, automatic alignment of mesh with mixing layers, and vectorized execution on a CRAY I computer. The temperature-dependent specific heat capacities and the effect of exhaust total temperature on the nozzle flow characteristics. A normal shock on the expansion ramp was evident in the SERN experimental data that was not predicted with the 2-D analysis. This shock was present whether the exhaust total temperature was hot or cold and its position was dependent on the total temperature. The capabilities and some of the problems of applying Navier-Stokes flow analysis procedure to computing viscous nozzle flows are demonstrated. The importance of measuring upstream conditions in flow experiments is emphasized if the data is to be utilized for explanation of flow variations which occur or for flow analysis validation. J.D.H.

N82-13080# Aircraft Research Association Ltd., Bedford (England).

A REVIEW OF THE EFFECT OF REYNOLDS NUMBER ON AFTERBODY DRAG **c02**

O. M. Pozniak *In* AGARD Aerodyn. of Power Plant Installation Sep. 1980 21 p refs (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01

The reported effects of a change in Reynolds number or boundary layer thickness on the afterbody drag of axisymmetric bodies and military type aircraft are reviewed. The significance of different Mach number regimes and of boattail steepness combinations is considered. At subsonic Mach numbers and in the absence of flow separations, significant but compensating pressure changes are found such that there is little effect on the afterbody pressure drag of complete afterbodies. In the presence of flow separations, the effects of Reynolds number tend to be small when the location of the flow separation is fixed as a result of a sudden change in the boattail contour, but on afterbodies with more continuous contours, the location of the point of separation can be affected; conflicting factors are then involved and the afterbody drag can increase or decrease by modest amounts, or remain unaffected by Reynolds number changes. Significant increases in drag for increases in Reynolds number have been consistently reported for high subsonic Mach numbers above the drag rise. J.D.H.

N82-13081# Societe Nationale d'Etudes et de Construction de Moteurs d'Aviation, Moissy-Cramayel (France).

A DEVICE FOR SIMULATING AT A COMPRESSOR BENCH AN AIR INLET WITH LARGE INCIDENCE [DISPOSITIF DE SIMULATION AU BANC COMPRESSEUR D'UNE PRISE D'AIR A GRANDE INCIDENCE] **c07**

Bertrand Delahaye and Gerard Laruelle (ONERA, Chatillon, France) *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 15 p refs In FRENCH; ENGLISH summary (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01

Increased maneuverability requirements for modern fighter aircraft involve an extensive inlet-engine compatibility analysis. Therefore, during the early stages of compressor development, the engine designer must estimate the surge margin loss resulting from inlet dynamic distortion over the complete flight envelope. A bell-mouth with varying lip thickness and a level-edged duct were designed to simulate the large vortices generated in an inlet at high angle of attack in a compressor test facility; the simulator was tested in a wind tunnel at ONERA and validated in a compressor test facility at SNECMA's Villaroche test center. The flow at the inlet/engine interface plane was characterized in the wind tunnel both for a 1/4 scale cylindrical duct at a Mach number of 0.6 and angles of attack up to 40 degrees and for different versions of the simulator in static conditions. Thereafter, a 30 degree level edged duct was tested at SNECMA with a full scale transonic fan stage. Scaling rules for acquisition time and frequency are used to compare the measurement in front of the fan with the results obtained in the subscale wind tunnel model. Author

N82-13082# Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France).

AN ACQUISITION AND ANALYSIS SYSTEM FOR DYNAMIC TESTS OF AIR INLETS [SYSTEME D'ACQUISITION ET D'ANALYSE POUR ESSAIS DYNAMIQUES D'ENTREES D'AIR] **c07**

Pierre Perrier, Bertrand Delahaye (SNWCMA, Moissy Cramayel, France), and Gerard Laruelle (ONERA, Chatillon, France) *In* AGARD Aerodyn. of Power Plant Installation Aug. 1981 14 p refs In FRENCH (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01

Improving the flight domain of combat aircraft leads to operations involving a much large variation of unsteady aerodynamic characteristics at the engine inlet than in the past. To determine if the augmentation will be effectively acceptable for compressors and engines of the future, sufficient knowledge of flows must be acquired. This entails measuring a sufficient number of unsteady flow characteristics; however, the number of measurements made must be limited because of cost as well as because of the possibility of instantaneous or deferred processing. This sequence of measurements takes into account necessary compromises. Cooperation is needed among the aircraft designer, the engine designer, and the research organization so that the work of each can complement that of the others, and an economy of means and a homogeneity of methods for analyzing and interpreting the results is possible. Transl. by A.R.H.

N82-13083# Volvo Flygmotor A.B., Trollhaettan (Sweden). Aerodynamics Dept.

A SYNTHESIS METHOD FOR ESTIMATING MAXIMUM INSTANTANEOUS INLET DISTORTION BASED ON MEASURED INLET STEADY STATE AND RMS PRESSURES **c02**

Ronald Borg *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 12 p refs (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01

A synthesis method based on steady state and root mean square (RMS) pressure measurements was developed using a simple mathematical computer model which estimates the maximum value of an engine distortion index. The estimated values obtained with the computer model were correlated with actual measured maximum instantaneous distortion values from several different tests and it is indicated that the method is useful in a inlet airframe engine configuration development program. The method is a tool for screening configurations before final selection and commitment to more expensive testing. The synthesis method is also complemented with extreme value analysis of the computer generated distortion data to evaluate the likely increase in maximum distortion index with increased time of observation. E.A.K.

N82-13084# Fluidyne Engineering Corp., Minneapolis, Minn.

MODEL TESTING TECHNIQUES FOR MEASURING INLET DRAG **c02**

James S. Holdhusen and James L. Grunnet *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 8 p refs (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01

Two methods of measuring inlet drag in transonic flow are described. In the first method, a flow through nacelle is tested in a transonic wind tunnel. Capture ratio is varied by installing individual annular blockers in the nacelle. Corrections for the drag force exerted by the captured streamtube are determined from blow through tests in a static test stand. In the second method, drag is determined directly using a special rig which has a variable loss throttle. The thrust exiting the control surface is determined by a choked ASME nozzle. The advantages and disadvantages of the two methods are compared. E.A.K.

N82-13085# National Defence Headquarters, Ottawa (Ontario). Directorate of Science and Technology.

COMPRESSOR STALL INDUCING INSTALLATION EFFECTS OF AN ENGINE CONTROL PARAMETER FOR THE CF-5 AIRCRAFT **c07**

W. L. Macmillan, D. M. Rudnitski, and W. Grabe *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 17 p Prepared in cooperation with National Research Council of Canada, Ottawa (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01

Compressor stall problems with CF-5 aircraft powered by two J85-CAN-15 engines were investigated. One major cause for compressor stalls as improper operation of the engines' control system under low temperature conditions was identified. It is demonstrated that this control system malfunction is the result of engine installation effects, which produce an erroneous compressor inlet temperature signal to the main fuel control unit. The degree of signal error for several flight conditions, such as level flight, high angles of attack, aircraft stalls, and weapons delivery profiles are identified. It is found that temperature errors are greater at high angles of attack where severe compressor inlet distortion acts cumulatively in reducing the stall margin under this flight condition. E.A.K.

N82-13086# Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).

THE ROLE AND IMPLEMENTATION OF DIFFERENT NACELLE/ENGINE SIMULATION CONCEPTS FOR WIND-TUNNEL TESTING IN RESEARCH AND DEVELOPMENT WORK ON TRANSPORT AIRCRAFT **c02**

B. Ewald and R. Smyth *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 35 p refs (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01

Different experimental methods and their specific roles in various stages of research and development were investigated. The main problem is the simulation and calibration of the propulsion system. Different simulation methods are: flow through nacelles, powered nacelles (blowing, turbine powered simulators (TPS), ejector powered), inlet models. The TPS represent the most advanced simulation of the high bypass ratio engine in model scale. A large part of the wind tunnel tests still have to rely upon flow through nacelles. A novel flow through nacelle with a variable plug is presented. It is shown that the combination of flow through nacelles and TPS can be efficiently used in the windtunnel investigation of propulsion system effects for transport aircraft. E.A.K.

N82-13087# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

WIND TUNNEL TESTS OF POWERED MODELS: A COMPARISON OF TWO METHODS OF SIMULATING THE JETS OF JET ENGINES [ESSAIS EN SOUFFLERIE DE MAQUETTES MOTORISEES; COMPARAISON DE DEUX METHODES DE SIMULATION DES JETS DES REACTEURS] **c07**

J. P. Becle and R. Perin (SNIAS, Toulouse) *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 18 p ref In FRENCH (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01

Two methods for simulating engine jets were developed at ONERA. The so-called blowing jets were previously mounted for studying the Concorde. The second method, which uses small air breathing turbines was recently installed for Airbus family aircraft. Tests were conducted on semi-models mounted on a balance with six components traversed by the flow from the engine. An original mounting permits the same measurement means to be used for any principle of power or type of test used (fixed point or wind tunnel test). The installations, means of measurement, and methods of using the results are described. The respective advantages of each type of power simulation are considered from the viewpoints of complexity, duration, and precision of measurements obtained. Transl. by A.R.H.

N82-13088# Aircraft Research Association Ltd., Bedford (England).

WIND TUNNEL TEST AND ANALYSIS TECHNIQUES USING POWERED SIMULATORS FOR CIVIL NACELLE INSTALLATION DRAG ASSESSMENT **c02**

A. E. Harris and E. C. Carter *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 16 p refs (For primary document see N82-13065 04-01)

Avail: NTIS HC A22/MF A01

Full span and semi-span wind tunnel model tests and powered nacelle calibration techniques are discussed in the context of civil nacelle installation drag assessment and optimization. In order to achieve the accuracy required for drag analysis it is necessary to determine the installed net thrust of the powered nacelle simulator to the equivalent of at least one aircraft drag count. This implies stringent control of mass flow and thrust accounting and imposes the need for consistency of approach in the wind-on and calibration tests where thrust and mass flow coefficients must be known to 0.1% to 0.2% accuracy. This need for high confidence in the data at all stages of analysis led to a methodology in which the measured data is combined in various ways to enhance confidence in its final use. Experiences

obtained in the use of a Mach simulation tank (MST) for the calibration of turbine powered simulator units are discussed. The MST is used to obtain simultaneous mass flow and thrust calibrations with representative internal nacelle conditions in the presence of a quiescent exhaust environment. Practical problems associated with the design of balance and airfeed arrangements are discussed along with the use of blown and turbine powered simulators. B.W.

N82-13089# Rolls-Royce Ltd., Derby (England).
ESTABLISHMENT OF AN EXPERIMENTAL TECHNIQUE TO PROVIDE ACCURATE MEASUREMENT OF THE INSTALLED DRAG OF CLOSE COUPLED CIVIL NACELLE/AIRFRAME CONFIGURATIONS, USING A FULL SPAN MODEL WITH TURBINE POWERED ENGINE SIMULATORS **c02**
G. Pugh and A. E. Harris (Aircraft Research Association Ltd., Bedford, England) *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 9 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

Definition and optimization of installed thrust/drag in civil nacelle installation design and development was studied. As a means of validating the calibration and thrust/drag analysis techniques bodied transport, Lockheed L1011, having high bypass ratio RB 211 turbofan engines with two alternative exhaust system designs was used. Wind tunnel model representation comprised a full span simulation with underwing mounted turbine powered engine simulators. Calibration techniques included the use of a Mach simulation tank in which concurrent mass flow and thrust calibrations were conducted in a quiescent exhaust environment. Data presented includes nacelle thrust and discharge coefficients, installed drag comparisons, and, finally, model to flight correlations. B.W.

N82-13090# National Aerospace Lab., Amsterdam (Netherlands).
EVALUATION OF AN EXPERIMENTAL TECHNIQUE TO INVESTIGATE THE EFFECTS OF THE ENGINE POSITION ON ENGINE/PYLON/WING INTERFERENCE **c02**
J. A. J. vanEngelen, B. Munniksma, and A. Elsenaar *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 13 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

A flexible experimental technique to study the effect of a variation of engine position for a range of test conditions was evaluated. In this test an underwing mounted 3/4 fancowl engine was investigated at six different positions as a free flow nacelle and as a strut mounted blown nacelle. Pressure and balance force measurements were made. Some typical aspects of the aerodynamic interference are discussed, notably the value of free flow nacelle measurements. Also a comparison of balance weighed and integrated pressure forces is presented. Results indicate that accurate simulation of the engine nozzle geometry is of prime importance for an investigation concerning engine/airframe integration. Nevertheless, tests on a free flow nacelle may still be useful for the selection of the most favourable engine position. A reasonable correlation was established between interference forces as obtained from pressure integration and balance measurements. However, the pressure forces tend to underestimate the balance forces. For a flexible pathfinder test, interference forces derived from pressure integration only appear to be very useful for the determination of trends in interference effects. B.W.

N82-13091# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
STUDIES OF AIR INLETS AT REYNOLDS NUMBERS COMPARABLE TO FLIGHT IN ONERA'S F1 AND S1MA WIND TUNNELS [ESSAIS DE PRISES D'AIR A DES NOMBRES DE REYNOLDS COMPARABLES AU VOL DANS LES SOUFFLERIES F1 ET S1MA DE L'ONERA] **c02**
J. Leynaert *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 12 p refs In FRENCH (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

The pressurization of the subsonic F1 wind tunnel at ONERA's Fauga-Mauzac Center was a benefit in wind tunnel tests of the air intakes of Airbus-type aircraft on a large scale at a Reynolds number near that of flight. The same model can thus be tested up to a Mach number near 1 in the S1MA wind tunnel at the Modane Center. Air intakes of military aircraft can likewise be studied in the two wind tunnels at high Reynolds numbers. The apparatus used, the methods of measurement, and the means of calibrating and control used to assure valid results are presented. Transl. by A.R.H.

N82-13092# British Aerospace Aircraft Group, Hertfordshire (England). Research Dept.
THE INFLUENCE OF CLOSED-COUPLED, REAR FUSELAGE MOUNTED NACELLES ON THE DESIGN OF AN ADVANCED HIGH SPEED WING **c05**
R. D. Laugher *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 17 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

The design approach aimed at integrating the effect of the nacelle into the basic wing design is described. Particular attention is drawn to the design risk associated with the modified inner wing supercritical flow development when nacelles are not represented in the transonic design calculations. Experimental test results are described which demonstrate the general success of the design technique. Finally, some results are presented from theoretical investigations in which an attempt was made to simulate the interference effect of the nacelle on the wing supercritical flowfield. A technique was developed whereby the nacelle and intake streamtube are replaced by an equivalent interfering body, which is derived from subcritical flow interference pressures. Results show that this technique provides a simple, cost effective tool for the supercritical design of a wing operating in the influence of a rear nacelle. M.D.K.

N82-13093# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Aerodynamics Dept.
AERODYNAMIC ASPECTS OF A HIGH BYPASS RATIO ENGINE INSTALLATION ON A FUSELAGE AFTERBODY **c02**
N. Voogt, J. vanHengst, and J. Th. v.d.Kolk (NRL) *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 10 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

The design process used in shaping rear fuselage mounted large diameter engine nacelles, pylons, and fuselage for a transport type aircraft is described. The objective was to suppress the local velocity levels and pressure gradients to avoid aerodynamic interference drag of the nacelle-pylon-fuselage combination in high speed cruise flight. Shapes of fuselage afterbody, nacelle, and stubwing were modified in a design-by-analysis process involving iterative and three dimensional singularity methods for inviscid subsonic flow. Windtunnel tests confirmed the adequacy of these methods. M.D.K.

N82-13094# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Service Aerodynamique Theorique.
A NUMERICAL METHOD FOR STUDYING NACELLE-JET-AIRFOIL INTERACTION IN INVISCID THREE-DIMENSIONAL FLOW [UNE METHODE NUMERIQUE POUR L'ETUDE DE L'INTERACTION NACELLE-JET-VOILURE EN ECOULEMENT TRIDIMENSIONEL NON VISQUEUX] **c02**
G. LeGall, J. Bousquet, and M. Yermia *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 13 p refs In FRENCH (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

The nacelle-jet-airfoil interaction is a complex three dimensional phenomena which is addressed in two simplified hypotheses: the fluid is incompressible and inviscid. Under these two hypotheses, the propulsive configuration is modeled by air intake with flow control and a propulsive jet with control of the pressure generator. A method of singularities is used which considers the sources and doublets of constant density and doublets of linear density on a flat panel. The equations which govern the problem constitute a nonlinear system which is divided into a linear part and a quadratic part. These two parts are solved iteratively by the Gauss-Seidel method and the Newton method. The free boundaries of the flow are also calculated by an iterative process which is integrated into the two preceding methods. Some practical results are proposed in two and three dimensional

flow. Comparison with tests permits evaluation of the advantage of the simplified hypotheses. Transl. by A.R.H.

N82-13095# Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).
CALCULATION OF WING-BODY-NACELLE INTERFERENCE IN SUBSONIC AND TRANSONIC POTENTIAL FLOW c02
K. D. Klevenhusen, H. Jakob, and H. Struck *In* AGARD Aerodyn. in Power Plant Installation Sep. 1981 8 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

A calculation method especially for transport aircraft wing design with consideration of wing/body or engine/airframe interference was developed. A hybrid method, consisting of a combination of panel method and finite difference method, is an improvement of a well proved analogy method. The panel method is of higher order using linear source and doublet distributions. The transonic flow region is removed from the entire flow field and the panel method is used for calculating boundary values for the subsequent finite difference method. The finite difference method solves the full potential equation in streamline coordinates. E.A.K.

N82-13096*# Boeing Military Airplane Development, Seattle, Wash.
PREDICTION OF SUBSONIC AIRCRAFT FLOWS WITH JET EXHAUST INTERACTIONS c02
D. W. Roberts *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 12 p refs (For primary document see N82-13065 04-01)
(Contract NAS2-10100)
Avail: NTIS HC A22/MF A01 CSCL 02A

A numerical procedure to calculate the flow fields resulting from the viscous inviscid interactions that occur when a strong jet exhaust and aircraft flow field coupling exists was developed. The approach divides the interaction region into zones which are either predominantly viscous or inviscid. The flow in the inviscid zone, which surrounds most of the aircraft, is calculated using an existing potential flow code. The viscous flow zone, which encompasses the jet plume, is modeled using a parabolized Navier-Stokes code. The procedure features the coupling of the zonal solutions such that sufficient information is transferred between the zones to preserve the effects of the interactions. The zonal boundaries overlap and the boundary conditions are the information link between zones. An iteration scheme iterates the coupled analysis until convergence has been obtained. E.A.K.

N82-13097# Douglas Aircraft Co., Inc., Long Beach, Calif.
PROP-FAN INTEGRATION AT CRUISE SPEEDS c05
H. Robert Welge *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 14 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

The aerodynamic installation features of a highly loaded turboprop (prop fan) on an aircraft for flight at Mach 0.8 are discussed. The aerodynamic flow environment in which the prop fan must operate is shown for both wing and aft-fuselage installations using advanced surface panel methods. The effects of prop fan slipstream parameters on the drag of a supercritical wing are presented indicating that only small drag penalties occur. Drag reductions are possible by tailoring the local wing section to account for the rotor induced flow. Using these inputs, an integrated wing/nacelle is shown. E.A.K.

N82-13098*# Boeing Commercial Airplane Co., Seattle, Wash. New Product Development Dept.
AIRFRAME-PROPULSION SYSTEM AERODYNAMIC INTERFERENCE PREDICTIONS AT HIGH TRANSONIC MACH NUMBERS INCLUDING OFF-DESIGN ENGINE AIRFLOW EFFECTS c02
R. M. Kulfan and A. Sigalla *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 23 p refs (For primary document see N82-13065 04-01)
(Contract NAS1-14623)
Avail: NTIS HC A22/MF A01 CSCL 02A

The transonic speed regime for airplanes at conditions where inlet spillage takes place is discussed. A wind tunnel test program to evaluate aerodynamic performance penalties associated with propulsion system installation and operation at subsonic through low supersonic speeds was conducted. The accuracy of analytic methods for predicting transonic engine airframe interference effects was assessed. Study variables included Mach number, angle of attack, relative celle location, and nacelle mass flow ratio. Results include test theory comparisons of forces as well as induced pressure fields. Prediction capability of induced shock wave strength and locations is assessed. It was found that large interference forces due to engine location and flow spillage occur at transonic speeds, that theory explains these effects; and that theory can predict quantitatively these effects. E.A.K.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N82-13099 Georgia Inst. of Tech., Atlanta.
A NUMERICAL STUDY OF LAMINAR UNSTEADY COMPRESSIBLE FLOW OVER AIRFOILS Ph.D. Thesis
Mohamed M. El-Refaee 1981 199 p
Avail: Univ. Microfilms Order No. 8124290

An integro-differential formulation for the numerical solution of the two dimensional compressible subsonic-Navier-Stokes equations is developed and presented. This formulation utilizes vorticity and dilatation as dependent variables in the govering equations. In contrast to the prevailing finite-difference techniques, the formulation is capable of confining the computations to the region of non-negligible vorticity and non-negligible difference in dilatation between the viscous flow and the potential flow around the same configuration. The accuracy and flexibility of the scheme are demonstrated by considering three test cases involving bodies of simple geometries. The numerical results are compared with available experimental data and finite difference solutions. Laminar compressible flow past a 9 percent thick Joukowski airfoil at 15 deg angle of attack is analyzed. The 'steamline like' lines in the compressible case show the appearance of a primary bubble. Dissert. Abstr.

N82-13100 Stanford Univ., Calif.
SOME OBSERVATIONS OF SURFACE PRESSURES AND THE NEAR WAKE OF A BLUNT TRAILING EDGE AIRFOIL Ph.D. Thesis
Ramarao Venkata Digumarthi 1981 191 p
Avail: Univ. Microfilms Order No. 8124053

Experiments with a truncated and untruncated airfoils of profiles NACA 640A10 were carried out in subsonic wind tunnels in a velocity range of 19 meters per second to 54 meters per second corresponding to Reynolds numbers of 2.0 x 10 to the 5th power to 4.68 x 10 to the 5th power based on the chord. Airfoil spanned the test section to achieve two dimensionality of the model. Chordwise static pressure distribution of the blunt trailing edge airfoil agreed with that for a smooth trailing edge airfoil except at the vicinity of the trailing edge. The boundary layer profiles in the midspan plane showed no separation as in the case of the smooth trailing edge airfoil. The spanwise distribution of the static pressure with tripped boundary layer, was found to be uniform on the upper surface of the airfoil, was found to be nonuniform as the trailing edge was approached for an untripped boundary layer configuration. Vortex shedding occurred behind blunt trailing edge airfoils and varied linearly with velocity. Although the intensity (RMS) of the base fluctuating pressure showed negligible variation in the spanwise direction, cross-correlations indicate spanwise phase variation in the base pressure. Dissert. Abstr.

N82-13101 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
NAVIER-STOKES SOLUTIONS FOR A SUPERSONIC COFLOWING AXISYMMETRIC NOZZLE WITH A THICK ANNULUS Ph.D. Thesis
Gerald Alan Hasen 1981 158 p
Avail: Univ. Microfilms Order No. 8119138

A numerical technique is developed that is capable of accurately predicting supersonic coflowing nozzle flowfields which contain both highly viscous regions and complex shock structures typified by the Mach disc formation. Numerical solutions to the Navier-Stokes equations are obtained for a domain containing an axisymmetric coflowing nozzle with a thick base annulus. The coflowing nozzle streams consist of a Mach 3.0 jet embedded in a Mach 1.94 turbulent external flowfield. Five nozzle pressure ratio conditions ranging from a highly overexpanded case which exhibits a Mach disc shock formation, to a slightly under-expanded case are examined and solved numerically. An efficient Lax-Wendroff type differencing scheme of second order accuracy which utilizes time-splitting and two-step predictor corrector techniques is used to solve the two dimensional Navier-Stokes equations. An adaptive grip scheme is utilized in the wake of the nozzle base annulus. A fully vectorized version of the present computer code can be expected to converge within five minutes on a CRAY-1 computer. Dissert. Abstr.

N82-13102 Georgia Inst. of Tech., Atlanta.
AN EXPERIMENTAL INVESTIGATION OF THE TURBULENT FLOW IN THE JUNCTION OF A FLAT PLATE AND A BODY OF CONSTANT THICKNESS Ph.D. Thesis
Ergun Abdullah Oguz 1981 208 p
Avail: Univ. Microfilms Order No. 8124294

The incompressible turbulent flow in the streamwise junction formed by a body of constant thickness, with a semielliptic leading edge, and an effectively infinite flat plate are investigated for two values of the flat plate upstream boundary layer thickness. In order to identify the magnitude and extent of the distortion of the mean flow and the turbulence field that is associated with the secondary flow system, total pressure, surface pressure, yaw angle, and mean, and fluctuating velocity measurements (in the direction of the local mean velocity vector) are conducted at three streamwise stations. The local yaw angles are determined utilizing the single hot wire rotation technique. A vortex-like secondary flow system in the junction operating in a sense with the flow moving away from the body near the plate surface and towards the body in the outer part of the junction flow region is observed. Dissert. Abstr.

N82-13103 Florida Univ., Gainesville.
REFINEMENT OF A METHOD FOR DETERMINING THE INDUCED AND PROFILE DRAG OF A FINITE WING FROM DETAILED WAKE MEASUREMENTS Ph.D. Thesis
Robert Paul Weston 1981 302 p
Avail: Univ. Microfilms Order No. 8124463

The drag of a moderate aspect ratio wing into profile and induced drag components is considered. The axial flow in the trailing vortex system suggests that a portion of the overall drag that is currently attributed to profile drag is actually linked to the trailing vortex strength and should be associated with the induced drag component. This drag portion, designated as the vortex core drag increment, is estimated near the wing. A diffuse vortex model is proposed as a way of determining the vortex core drag increment from transverse velocity measurements in downstream cross sections of the wing wake. The sum of the integrated profile and induced drag values obtained from wake measurements show agreement with the total drag values obtained from force balance measurements. Dissert. Abstr.

N82-13104 Iowa Univ., Oakdale.
TURBULENT WAKE DEVELOPMENT BEHIND STREAMLINED BODIES Ph.D. Thesis
Sastry Suryanarayana Munukutla 1981 316 p
Avail: Univ. Microfilms Order No. 8123346

The developing turbulent wake behind streamlined bodies is reported. Detailed measurements of mean and turbulent flow properties are made in three different wake flows. The first is the symmetric wake of a flat plate, the second is the asymmetric wake of a flat plate, (asymmetry being produced by roughening on side of the plate) and the third is the curved wake of an asymmetric airfoil at incidence. It is possible to identify three important regions in the wake, namely the near wake, intermediate wake and the far wake. The performance of the existing turbulence models in the case of the symmetric flat plate wake is studied. The near and intermediate wake regions are predicted by a sophisticated turbulence model. Dissert. Abstr.

N82-13105 Stanford Univ., Calif.
AN EXPERIMENTAL INVESTIGATION OF THE FLOW PAST A FINITE CIRCULAR CYLINDER AT A LOW SUBCRITICAL REYNOLDS NUMBER Ph.D. Thesis
Muhammad Umar Budair 1981 139 p
Avail: Univ. Microfilms Order No. 8124045

Results of hot-wire measurements made in the near-wake of a finite circular of fixed aspect ratio (l/D = 37) at a Reynolds number of 9955 are reported. The measurements included the mean velocity profiles, root-mean-square values of the velocity fluctuations, frequency spectra, and velocity cross-correlations. The mean velocity profiles were used to determine the wake width, whose variation in the downstream and spanwise directions was examined. It was found that the flow over the span can be characterized by four regions: (1) A tip region where vortex shedding occurs at a lower frequency than that prevalent far away from the tip. (2) An intermediate region adjacent to the first one where a frequency component of a nonshedding character is present. (3) A third region characterized by a gradually increasing shedding frequency with increasing distance from the tip. (4) A two dimensional region where the shedding frequency is constant. The propagating character of the frequency component present in region 2 was studied. Dissert. Abstr.

N82-13106*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FORCE AND MOMENT, FLOW-VISUALIZATION, AND BOUNDARY-LAYER TESTS ON A SHUTTLE ORBITER MODEL AT MACH 6
Robert L. Calloway Dec. 1981 25 p refs
(NASA-TP-1952; L-14782) Avail: NTIS HC A02/MF A01 CSCL 01A

Force and moment, flow visualization, and boundary layer state tests were conducted using two 0.004 scale shuttle orbiter models. The force and moment tests were conducted for an angle of attack range from 20 to 40 deg and for Reynolds numbers based on reference length from 0.4 million to 3.6 million. Schlieren photographs were obtained for each angle of attack and Reynolds number. The boundary layer state tests, which were conducted using hot film sensors mounted in a separate model, were conducted over the same range of conditions as the force tests. Test results were combined to show that changes in the boundary layer on a typical hypersonic force test model affect measurement of the axial force coefficient and that the state of the local boundary layer is important for interpreting hypersonic aerodynamic test results. S.L.

N82-13107*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WIND-TUNNEL INVESTIGATION OF THE EFFECTS OF BLADE TIP GEOMETRY ON THE INTERACTION OF TORSIONAL LOADS AND PERFORMANCE FOR AN ARTICULATED HELICOPTER ROTOR
William T. Yeager and Wayne R. Mantay Dec. 1981 64 p refs Prepared in cooperation with Army Aviation Research and Development Command, Hampton, Va.
(DA Proj. 1L2-62209-AH-76)
(NASA-TP-1926; AVRADCOM-TR-81-B-5; L-14674) Avail: NTIS HC A04/MF A01 CSCL 01A

The Langley transonic dynamics tunnel was used to determine the degree of correlation between rotor performance and the dynamic twist generated by changes in blade tip geometry using an articulated rotor with four different tip geometries at advance ratios of 0.20, 0.30 and 0.35. Based on the data obtained, it is concluded that: (1) there appears to be no strong correlation between blade torsion loads and rotor performance prediction; (2) for a given rotor task at each advance ratio investigated, both the azimuthal variation of torsional moment and the mean torsional moment at 81% radius are configuration dependent; (3) reducing the nose down twist on the advancing blade appears to be more important to forward flight performance than increasing the nose down twist on the retreating blade; (4) the rotor inflow model used was important in predicting the performance of the adaptive rotor; and (5) neither rigid blade solidity effects, inflow environment, nor blade torsion loads can be used alone to accurately predict active rotor performance.
A.R.H.

N82-13108*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

CROSSFLOW EFFECTS ON STEADY AND FLUCTUATING PRESSURES ON AN OGIVE-CYLINDER CONE-FRUSTUM MODEL IN SUPERSONIC SEPARATED FLOW

Jules B. Dods, Jr. (Raman Aeronautics Research and Engineering, Inc., Palo Alto, Calif.) and Charles F. Coe Nov. 1981 58 p refs

(Contract NAS2-10139)

(NASA-TP-1951; A-8563) Avail: NTIS HC A04/MF A01 CSCL 01A

Wind-tunnel tests were conducted on an ogive-cylinder model with two axisymmetric protuberances having cone frustum angles of cone = 23 deg and 45 deg that were used to generate detached shock waves and the resulting separated flow areas downstream of the shock. The tests were conducted in a 9 by 7 foot supersonic wind tunnel at a free-stream Mach number of 2.0 and at Reynolds numbers of 1.5 x 1 million and 3.9 x 1 million, based on body diameter. The model had an afterbody fineness ratio of 8.3, and the ogive nose had a fineness ratio of 3.0. Two characteristics of the fluctuating pressures in surface vortex flows that result from the crossflow component, (velocity along the tunnel longitudinal axis free stream angle of attack), in combination with changes in the longitudinal pressure gradient were measured: (1) the broadband, rms-pressure coefficients and (2) the power spectral densities. Measurements are presented for various flow regions on the model such as the attached turbulent boundary layer, the detached frustum shock wave, and separated flow areas. The results indicate that the pressure fluctuations around or in the neighborhood of the foci of the vortex flows had broadband intensities and power spectral densities nearly identical to the levels previously measured in separated-flow regions at angles of attack of 0 deg. R.J.F.

N82-13109# National Aerospace Lab., Tokyo (Japan).

AN AERODYNAMIC DESIGN AND THE OVERALL STAGE PERFORMANCE OF AN AIR-COOLED AXIAL-FLOW TURBINE

Atsumasa Yamamoto, Kitao Takahara, Hiroyuki Nouse, Shigeo Inoue, Hiroschi Usui, and Fugio Mimura Jan. 1981 44 p refs (NAL-TR-321T) Avail: NTIS HC A03/MF A01

In order to investigate air-cooled turbines for application to high-temperature engines, a single stage turbine with a 0.56-m (22-inch) tip diameter was designed. The aerodynamical design procedures of the turbine are presented. The stator and rotor blades are characterized by low blade solidity, thick blade section, blunt leading edge and trailing edge, and low blade aspect ratio. A cold air test without supply of cooling air was conducted to determine the turbine aerodynamic performance. The highest efficiency obtained over the range of conditions investigated was 0.865. The turbine satisfied the equivalent design value of specific work output at the design condition (i.e., at equivalent design speed and equivalent design pressure ratio) with an efficiency of 0.856. Detailed surveys of rotor-outlet gas flow were made with Pitot tubes and temperature sensors and the results are also presented. T.M.

N82-13110*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

PRESSURE DISTRIBUTIONS ON THREE DIFFERENT CRUCIFORM AFT-TAIL CONTROL SURFACES OF A WINGLESS MISSILE AT MACH 1.60, 2.36, AND 3.70. VOLUME 1: TRAPEZOIDAL TAIL

Milton Lamb, Wallace C. Sawyer, Donald L. Wassum, and C. Donald Babb Aug. 1979 345 p

(NASA-TM-80097; L-12993-Vol-1) Avail: NTIS HC A15/MF A01 CSCL 01A

The results of pressure distribution tests conducted in a wind tunnel are presented without analysis. The data were obtained for trapezoidal aft tail control surfaces on a wingless missile model at Mach numbers of 1.60, 2.36, and 3.70 for angles of attack from -4 to 20 deg model roll angles from 0 to 90 deg and tail deflections of 0 and -15 deg. The test Reynolds number used was 6.6 million per meter. M.D.K.

N82-13111# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.

FORCE MEASUREMENTS ON A REFLEX CAMBERED DELTA WING

V. S. Holla, M. D. Aravamudhan, and P. Jagadeesha Rao 23 Jul. 1981 35 p refs Backup document for AIAA synoptic scheduled for publication in Journal of Aircraft in Mar. 1982

(LOG-C4073) Avail: NTIS HC A03/MF A01

The effect of reflex spanwise camber on the lift, drag, lift to drag ratio and the pitching moment coefficients were studied on a reflex spanwise cambered slender delta wing with conical camber and a plane delta wing. At subsonic speeds, both with and without yaw, the cambered wing has less lift at a given incidence and higher lift to drag ratio at a given lift than the plane wing. At supersonic speeds, both lift at any incidence and lift to drag ratio at a given lift coefficient were less on the cambered wing than on the plane wing. Flow visualization studies at subsonic speeds show that the spanwise camber both delays and reduces the intensity and extent of the flow separation along the leading edges. At supersonic speeds, at the design Mach number and incidence, there is good agreement between results from theory and experiment. The center of pressure position of the cambered wing is ahead of that of plane wing at subsonic speeds while the reverse is true at supersonic speeds. A.R.H.

N82-13112*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THRUST MODULATION METHODS FOR A SUBSONIC V/STOL AIRCRAFT

Richard R. Woollett 1981 18 p refs Presented at V/STOL Conf., Palo Alto, Calif., 7-9 Dec. 1981; sponsored by AIAA and NASA Ames

(NASA-TM-82747; E-1063) Avail: NTIS HC A02/MF A01 CSCL 01A

Low speed wind tunnel tests were conducted to assess four methods for attaining thrust modulation for V/STOL aircraft. The four methods were: (1) fan speed change, (2) fan nozzle exit area change, (3) variable pitch rotor (VPR) fan, and (4) variable inlet guide vanes (VIGV). The interrelationships between inlet and thrust modulation system were also investigated using a double slotted inlet and thick lip inlet. Results can be summarized as: (1) the VPR and VIGV systems were the most promising, (2) changes in blade angle to obtain changes in fan thrust have significant implications for the inlet, and (3) both systems attained required level of thrust with acceptable levels of fan blade stress. M.D.K.

N82-13113*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPUTATIONAL METHODS FOR INTERNAL FLOWS WITH EMPHASIS ON TURBOMACHINERY

William D. McNally and Peter M. Sockol 1981 79 p refs Presented at the Symp. on Computers in Flow Predictions and Fluid Dyn. Exp. at the ASME Winter Ann. Meeting, Washington, D.C., 15-20 Nov. 1981

(NASA-TM-82764; E-1085) Avail: NTIS HC A05/MF A01 CSCL 01A

Current computational methods for analyzing flows in turbomachinery and other related internal propulsion components are presented. The methods are divided into two classes. The inviscid methods deal specifically with turbomachinery applications. Viscous methods, deal with generalized duct flows as well as flows in turbomachinery passages. Inviscid methods are categorized into the potential, stream function, and Euler aproaches. Viscous methods are treated in terms of parabolic, partially parabolic, and elliptic procedures. Various grids used in association with these procedures are also discussed. Author

N82-13114*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE EFFECT OF ROTOR BLADE THICKNESS AND SURFACE FINISH ON THE PERFORMANCE OF A SMALL AXIAL FLOW TURBINE

Richard J. Roelke and Jeffrey E. Haas 1982 13 p refs Proposed for presentation at the Gas Turbine Ann. Meeting, London, 18-22 Apr. 1982; sponsored by ASME Prepared in cooperation with Army Aviation Research and Development Command, Cleveland

(Contract DE-AI01-77CS-51040)

(NASA-TM-82726; DOE/NASA/51040-34; TR-81-C-29) Avail: NTIS HC A02/MF A01 CSCL 21E

An experimental investigation was conducted to determine the effect of blade profile inaccuracies and surface finish on the aerodynamic performance of a 11.13 cm tip diameter turbine. The as-received cast rotor blades had a significantly thicker profile than the design intent and a fairly rough surface finish. Stage test results showed an increase of one point in efficieny by smoothing the surface finish and another three points by thinning the blade profiles to near the design profile. Most of the performance gain between the as-cast thick and the thinned rotor blades both with the same surface finish, was attributed to reduced trailing edge losses of the recontoured blades. Author

N82-13115# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).

A CALCULATION METHOD FOR SLENDER WING-BODY CONFIGURATIONS IN SUPERSONIC FLOW AT HIGH ANGLES OF ATTACK [EIN BERECHNUNGSVERFAHREN FUER SCHLANKE FLUEGEL-RUMPFANORDNUNGEN IM UEBERSCHALL BEI HOHEN ANSTELLWINKELN]

D. Nikolitsch Bonn Bundesministerium der Verteidigung 1979 58 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung

(BMVg-FBWT-79-15) Avail: NTIS HC A04/MF A01; DOK-ZENTBw, Bonn DM 30

An analysis which determines nonlinear force and pitching moment characteristics of slender bodies and slender wing-body configurations at high angles of attack in supersonic flow is presented. The linear coefficients of the body are calculated by means of a singularity distribution along the body axis. The nonlinear coefficients are determined by a method based on Wardlaw's multivortex model which is modified so that it is applicable at Mach > 1. The wing characteristics are calculated with the Huerlimann prediction method; this method is limited to slender, tapered wing planforms. The mutual interference of wing and body is accounted for by Nielsen interference factors. The range of application of the analysis is exemplified by sample calculations. Author (ESA)

N82-13116# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Flugzeuge.

FINAL REPORT ON THE FUEFO-4 MAJOR THEME: INTERFERENCE DRAG WITH AIRFRAME/ENGINE INTEGRATION ON FIGHTER AIRCRAFT Final Report [ABSCHLUSSBEREICHT ZUM RUEFO-4 RAHMENTHEMA 'INTERFERENZWIDERSTAND BEI DER ZELLEN-/TREIBWERKSINTEGRATION VON KAMPFFLUGZEUGEN']

H. L. Weinreich and R. Smyth (Vereinigte Flugtechnische Werke-Fokker GmbH, Bremen, West Germany) Bonn Bundesministerium der Verteidigung 1979 182 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung

(BMVg-FBWT-79-20) Avail: NTIS HC A09/MF A01; DOK-ZENTBw, Bonn DM 40

Theoretical and experimental (wind tunnel) studies of engine nozzle characteristics as well as of engine/airframe aerodynamic interaction are summarized. Results significant to fighter aircraft configuration optimization are identified. Wind tunnel experiment design is also critically assessed. Results emphasized concern: experimental data for parameters influencing afterbody drag; theoretical and construction concepts of variable 'CONDI' nozzles; theoretical methods for the correction of wind tunnel data; the synthesis of inlet drag; and investigations of jet decay structures. Author (ESA)

N82-13117# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).

CONTRIBUTIONS TO THE AERODYNAMICS OF WING-BODY CONFIGURATIONS IN THE NONLINEAR RANGE OF ANGLES OF ATTACK [ZUR AERODYNAMISCHEN BERECHNUNG VON FLUEGELRUMPF-KONFIGURATIONEN IM NICHT-LINEAR EN ANSTELLWINKEL-BEREICH]

D. Nikolitsch and P. Hennig Bonn Bundesministerium der Verteidigung 1980 72 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung

(BMVg-FBWT-80-11) Avail: NTIS HC A04/MF A01; DOK-ZENTBw, Bonn DM 30

The prediction of normal force and pitching moment of cruciform wing-body configurations at subsonic speed, high angles of attack, and arbitrary roll position by means of coefficient synthesis is discussed. The aerodynamic coefficients of the exposed wing are determined, using the vortex lattice technique, assuming that the free vortices leave the wing panels inclined by half the angle of attack. The three dimensional base flow of wing-body configurations at subsonic speed was investigated theoretically. The dividing stream surface is assumed to be closed and axisymmetric and is simulated by source-sink distributions. The influence of the base flow on body and wing is verified for different wing positions, Mach numbers and angles of attack. Author (ESA)

N82-13118# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

INVESTIGATION OF THE VORTEX FIELD GENERATED BY AN AIRFOIL MODEL IN A WIND TUNNEL, USING ULTRASONIC PULSES

Rolf H. Engler and Dieter W. Schmidt 1979 155 p refs In GERMAN; ENGLISH summary

(MPIS-MITT-69; ISSN-0374-1257) Avail: NTIS HC A08/MF A01

The development of the tip vortex generated by a rectangular wing of aspect ratio five in the region closely behind the wing was investigated by means of ultrasonic pulses in a 3m x 3m wind tunnel. This technique does not perturb the flow field and is based on the time-of-flight variations of the ultrasonic pulses due to acceleration or deceleration by tail or head winds. Vortex position, core diameter, circumferential velocity, and circulation were measured as a function of angle of attack and of main flow velocity up to 40 m/sec at Reynolds numbers up to 400,000. The data evaluation is aided by a theoretical model based on a Hamel-Oseen vortex. The influence of spoiler configurations on the tip vortex and the near flow field upstream of the wing were also investigated. Author (ESA)

N82-13119# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Instationaere Aerodynamik.

AN ANALYTICAL AND EXPERIMENTAL STUDY OF THE STEADY AND UNSTEADY AIRLOADS ON A WING WITH OSCILLATING CONTROL INCLUDING A STREAMLINED GAP

Wolfgang Geissler Feb. 1981 52 p refs

(DFVLR-FB-81-18) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 13,50

A wing section with oscillation control was studied in a 3m low speed wind tunnel. In order to simulate a realistic configuration, the gap between wing and control surface was streamlined. A modified analytical surface singularity method, taking into account the exact boundary conditions and Bernoulli equation, was developed. With this method the problem is handled as an inteference problem between two lifting bodies with two Kutta conditions. Local lift distributions obtained from both experiment and theory are compared for a variety of parameters, such as aspect ratio, section incidence, steady flap deflection, oscillation frequency, wake location, and open/closed slot. Outside the gap the correspondence between the exact potential theory and the experimental data is excellent. Deviations within the gap region are attributed to viscous effects. Author (ESA)

N82-13120 Purdue Univ., Lafayette, Ind.

AN EXPERIMENTAL STUDY OF TOLLMIEN-SCHLICHTING WAVE CANCELLATION Ph.D. Thesis

Robert Weldon Milling 1981 106 p

Avail: Univ. Microfilms Order No. 8123681

A method is proposed which would maintain laminar flow by cancelling boundary layer disturbance waves in the initial stages of growth by interference with artificially created waves of the proper amplitude and phase. An experiment was conducted to determine if the simplest possible disturbance, a Tollmien-Schlichting wave, could be cancelled by interference with an artificially generated disturbance. A flat plate with essentially zero pressure gradient in a low turbulence water channel was used. The disturbance wave and the cancellation wave were introduced artificially by electromagnetically driven wave generators located 59.5 inches and 83.5 inches, respectively, from the leading edge of the flat plate. The nominal flow velocity was

0.5 to 0.6 feet per second. Two dimensional flow was maintained over a region 3 inches to each side of the centerline of the flat plate which was 14 feet long. Cancellation of as high as 90% was shown to be possible, although, generally, absolute amplitudes of the perturbation velocity much below 0.1% of the freestream velocity were seldom obtained. Dissert. Abstr.

N82-13121 Stanford Univ., Calif.
AERODYNAMICS OF AN AIRFOIL WITH A JET ISSUING FROM ITS SURFACE Ph.D. Thesis
Domingo Armando Tavella 1981 94 p.
Avail: Univ. Microfilms Order No. 8124165

A simple, two dimensional, incompressible and inviscid model for the problem posed by a two dimensional wing with a jet issuing from its lower surface is considered and a parametric analysis is carried out to observe how the aerodynamic characteristics depend on the different parameters. The mathematical problem constitutes a boundary value problem where the position of part of the boundary is not known a priori. A nonlinear optimization approach is used to solve the problem, and the analysis reveals interesting characteristics that may help to better understand the physics involved in more complex situations in connection with high-lift systems. Dissert. Abstr.

N82-13122 Stanford Univ., Calif.
UNSTEADY AEROELASTIC MODELING AND TRAILING-EDGE FLAP CONTROL OF AN EXPERIMENTAL WING IN A TWO DIMENSIONAL WIND TUNNEL Ph.D. Thesis
Paul Murray Stoltz 1981 232 p
Avail: Univ. Microfilms Order No. 8124159

Theoretical and experimental investigations into unsteady aeroelastic modeling and trailing edge flap control are presented for a wing flap system mounted in a two dimensional wind tunnel. The unsteady pressure distribution over the wing and flap is estimated from linearized potential theory, where the airflow is assumed incompressible and inviscid. An analytical model is developed which includes the wing flap structural states plus one additional state to represent the unsteady aerodynamics. A root focus of the analytical aeroelastic eigenvalues versus dynamic pressure is presented and compared with experimental behavior for dynamic pressures in the range zero to twice the flutter value. A control law is developed to stabilize the wing flap system at a dynamic pressure equal to twice the open loop flutter value. A regulator is developed which incorporates full state feedback and estimation. Theoretically predicted and experimentally measured closed loop aeroelastic eigenvalues are compared for dyamic pressures in the range zero to twice the open loop flutter value. Dissert. Abstr.

N82-13066# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
PERFORMANCE OF HIGHLY INTEGRATED INLETS FOR SUPERSONIC AIRCRAFT
Lewis Surber, Jan Syberg, and Joseph Koncsek *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 12 p refs Prepared in cooperation with Boeing Military Airplane Co., Seattle (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13067*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TOP-MOUNTED INLET SYSTEM FEASIBILITY FOR TRANSONIC-SUBSONIC FIGHTER AIRCRAFT APPLICATIONS
T. L. Williams, B. L. Hunt, D. B. Smeltzer, and W. P. Nelms *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 17 p refs Prepared in cooperation with Northrop Corp., Hawthorne, Calif. (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01 CSCL 01A

N82-13068# Royal Aircraft Establishment, Bedford (England). Aerodynamics Dept.
SOME RAE RESEARCH ON SHIELDED AND UNSHIELDED FUSELAGE MOUNTED AIR INTAKES AT SUBSONIC AND SUPERSONIC SPEEDS
J. A. Ross, I. McGregor, and A. J. Priest *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 16 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13069# National Gas Turbine Establishment, Pyestock (England).
PREDICTION AND MEASUREMENT OF TIME-VARIANT, THREE-DIMENSIONAL FLOWS IN MILITARY AIRCRAFT INTAKES
D. E. Colbourne and J. E. Flitcroft *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 18 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13070# British Aerospace Aircraft Group, Bristol (England).
EFFECTS OF INTAKE GEOMETRY ON CIRCULAR PITOT INTAKE PERFORMANCE AT ZERO AND LOW FORWARD SPEEDS
A. C. Willmer, T. W. Brown, and E. L. Goldsmith (RAE, Bedford, England) *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 16 p refs Sponsored in part by Ministry of Defence (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13071# Institut de Mecanique des Fluides de Lille (France).
TRANSONIC FLOWS IN AN AIR INLET WITH LARGE INCIDENCE AND THE EFFECT OF A BLOWING TRAP [ECOULEMENTS TRANSSONIQUES DANS UNE PRISE D'AIR EN GRANDE INCIDENCE AT EFFET DE TRAPPE DE SOUFFLAGE]
A. Dyment, P. Gryson, and J. P. Flodrops *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 13 p ref In FRENCH (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13072# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Theoretical Aerodynamics Dept.
CALCULATION OF TRANSONIC AIR-INTAKES USING A COMPUTER PACKAGE FOR INVISCID AND BOUNDARY LAYER FLOWS
Ciro W. Lucchi *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 4 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13073# Aeritalia S.p.A., Torino (Italy). Combat Aircraft Group.
SUBSONIC MILITARY AIRCRAFT ENGINE INTAKE: AN INTEGRATED THEORETICAL EXPERIMENT DESIGN
G. Bertolone and L. Fornasier *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 17 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13080# Aircraft Research Association Ltd., Bedford (England).
A REVIEW OF THE EFFECT OF REYNOLDS NUMBER ON AFTERBODY DRAG
O. M. Pozniak *In* AGARD Aerodyn. of Power Plant Installation Sep. 1980 21 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13083# Volvo Flygmotor A.B., Trollhaettan (Sweden). Aerodynamics Dept.
A SYNTHESIS METHOD FOR ESTIMATING MAXIMUM INSTANTANEOUS INLET DISTORTION BASED ON MEASURED INLET STEADY STATE AND RMS PRESSURES
Ronald Borg *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 12 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13084# Fluidyne Engineering Corp., Minneapolis, Minn.
MODEL TESTING TECHNIQUES FOR MEASURING INLET DRAG
James S. Holdhusen and James L. Grunnet *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 8 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13086# Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).
THE ROLE AND IMPLEMENTATION OF DIFFERENT NACELLE/ENGINE SIMULATION CONCEPTS FOR WIND-TUNNEL TESTING IN RESEARCH AND DEVELOPMENT WORK ON TRANSPORT AIRCRAFT
B. Ewald and R. Smyth *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 35 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13088# Aircraft Research Association Ltd., Bedford (England).
WIND TUNNEL TEST AND ANALYSIS TECHNIQUES USING POWERED SIMULATORS FOR CIVIL NACELLE INSTALLATION DRAG ASSESSMENT
A. E. Harris and E. C. Carter *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 16 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13089# Rolls-Royce Ltd., Derby (England).
ESTABLISHMENT OF AN EXPERIMENTAL TECHNIQUE TO PROVIDE ACCURATE MEASUREMENT OF THE INSTALLED DRAG OF CLOSE COUPLED CIVIL NACELLE/AIRFRAME CONFIGURATIONS, USING A FULL SPAN MODEL WITH TURBINE POWERED ENGINE SIMULATORS
G. Pugh and A. E. Harris (Aircraft Research Association Ltd., Bedford, England) *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 9 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13090# National Aerospace Lab., Amsterdam (Netherlands).
EVALUATION OF AN EXPERIMENTAL TECHNIQUE TO INVESTIGATE THE EFFECTS OF THE ENGINE POSITION ON ENGINE/PYLON/WING INTERFERENCE
J. A. J. vanEngelen, B. Munniksma, and A. Elsenaar *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 13 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13091# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
STUDIES OF AIR INLETS AT REYNOLDS NUMBERS COMPARABLE TO FLIGHT IN ONERA'S F1 AND S1MA WIND TUNNELS [ESSAIS DE PRISES D'AIR A DES NOMBRES DE REYNOLDS COMPARABLES AU VOL DANS LES SOUFFLERIES F1 ET S1MA DE L'ONERA]
J. Leynaert *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 12 p refs In FRENCH (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13093# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Aerodynamics Dept.
AERODYNAMIC ASPECTS OF A HIGH BYPASS RATIO ENGINE INSTALLATION ON A FUSELAGE AFTERBODY
N. Voogt, J. vanHengst, and J. Th. v.d.Kolk (NRL) *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 10 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13094# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Service Aerodynamique Theorique.
A NUMERICAL METHOD FOR STUDYING NACELLE-JET-AIRFOIL INTERACTION IN INVISCID THREE-DIMENSIONAL FLOW [UNE METHODE NUMERIQUE POUR L'ETUDE DE L'INTERACTION NACELLE-JET-VOILURE EN ECOULEMENT TRIDIMENSIONEL NON VISQUEUX]
G. LeGall, J. Bousquet, and M. Yermia *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 13 p refs In FRENCH (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13095# Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).
CALCULATION OF WING-BODY-NACELLE INTERFERENCE IN SUBSONIC AND TRANSONIC POTENTIAL FLOW
K. D. Klevenhusen, H. Jakob, and H. Struck *In* AGARD Aerodyn. in Power Plant Installation Sep. 1981 8 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13096*# Boeing Military Airplane Development, Seattle, Wash.
PREDICTION OF SUBSONIC AIRCRAFT FLOWS WITH JET EXHAUST INTERACTIONS
D. W. Roberts *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 12 p refs (For primary document see N82-13065 04-01)
(Contract NAS2-10100)
Avail: NTIS HC A22/MF A01 CSCL 02A

N82-13098*# Boeing Commercial Airplane Co., Seattle, Wash. New Product Development Dept.
AIRFRAME-PROPULSION SYSTEM AERODYNAMIC INTERFERENCE PREDICTIONS AT HIGH TRANSONIC MACH NUMBERS INCLUDING OFF-DESIGN ENGINE AIRFLOW EFFECTS
R. M. Kulfan and A. Sigalla *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 23 p refs (For primary document see N82-13065 04-01)
(Contract NAS1-14623)
Avail: NTIS HC A22/MF A01 CSCL 02A

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N82-13123*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GUIDELINES FOR LINE-ORIENTED FLIGHT TRAINING, VOLUME 2
John K. Lauber and H. Clayton Foushee 1981 156 p refs Proceedings of conf. held at NASA Ames Research Center, Calif., 13-15 Jan. 1981
(NASA-CP-2184-Vol-2) Avail: NTIS HC A08/MF A01 CSCL 05I

Current approaches to line-oriented flight training used by six American airlines are described. This recurrent training methodology makes use of a full-crew and full-mission simulation to teach and assess resource management skills, but does not necessarily fulfill requirements for the training and manipulation of all skills. For individual titles, see N82-13124 through N82-13134.

N82-13124*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ISSUES RELATED TO LINE-ORIENTED FLIGHT TRAINING
John K. Lauber *In its* Guidelines for Line-oriented Flight Training, Vol. 2 1981 p 14-25 (For primary document see N82-13123 04-03)
Avail: NTIS HC A08/MF A01 CSCL 05I

The use of a training simulator along with carefully structured, detailed, line trip scenarios was envisioned by NASA as a means of providing a controllable, repeatable way to observe line crews in a highly realistic simulation of their working environment and obtain better understanding operationally significant human factors problems and issues. Relevant research done by the agency and the results of full-mission simulation scenarios revealed potential implications for flight training. Aspects to be considered in creating training programs closely related to the actual line environment with a total crew application in real world incident experiences include: (1) operational, environmental, equipment, and crew problems in scenario design; (2) real time line oriented flight training operation; (3) performance assessment and debriefing; (4) instructor qualification and training; and (5) other issues such

as ub un initial, transition, and upgrade training; procedures development and evaluation, and equipment evaluation. A.R.H.

N82-13125*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LINE-ORIENTED FLIGHT TRAINING: NORTHWEST AIRLINES
H. T. Nunn *In its* Guidelines for Line-oriented Flight Training, Vol. 2 1981 p 26-42 (For primary document see N82-13123 04-03)
Avail: NTIS HC A08/MF A01 CSCL 05I

An exemption from certain FAA regulations which stereotype simulator flight training was obtained and pilots with current line experience were used to prepare and develop scenarios for a program in which each crew member would be trained to recognize and properly use all available resouces. The development of the scenarios for training to proficiency and pilot reaction to the training sessions are discussed. A.R.H.

N82-13126*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
UNITED AIRLINES LOFT TRAINING
Dale Cavanagh and Bill Traub *In its* Guidelines for Line-oriented Flight Training, Vol. 2 1981 p 43-55 (For primary document see N82-13123 04-03)
Avail: NTIS HC A08/MF A01 CSCL 05I

Line oriented training is used in a broader, more generic sense that as a specific program under FAR 12.1409 and AC 120-35. A company policy was adopted more thany twenty years ago requiring that all pilot checks and recurrent training be conducted with a full crew occupying the seats they occupy on the line. Permission was obtained to reschedule the hours for recurrent proficiency training to include one and one-half hours of LOFT flight. The number of emergencies and abnormal procedures which could be undertaken were considered and the introduction of an a occasional incapacitation revealed which person is the most difficult to replace on the widebodies. By using the LOFT concept, every training period can be structured like a typical line flight. The use of LOFT in simulator syllabus development and problems that need to be refined are discussed. A.R.H.

N82-13127*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EASTERN AIRLINES LOFT PROGRAM
Berton E. Beach *In its* Guidelines for Line-oriented Flight Training, Vol. 2 1981 p 56-70 (For primary document see N82-13123 04-03)
Avail: NTIS HC A08/MF A01 CSCL 05I

Beginning with scenario design and development issues, Eastern Airlines committed itself to the full four-hour LOFT training format without the additional time for specific maneuvers. Abnormals and emergency conditions, pacing, and quiet periods are included in the scenarios which are written for the instructor to follow verbatim. Simulator capabilities, performance assessment; training vs. checking; crew composition and scheduling; satisfactory completion; the use of video performance printouts; the number of instructors; instructor training and standardization; and initial, transition, and upgrade training are discussed. A.R.H.

N82-13128*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TEXAS INTERNATIONAL AIRLINES LOFT PROGRAM
Jack Sommerville *In its* Guidelines for Line-oriented Flight Training, Vol. 2 1981 p 71-78 (For primary document see N82-13123 04-03)
Avail: NTIS HC A08/MF A01 CSCL 05I

A line-oriented flight training program which allows the crew to work as a team to solve all problems, abnormal or emergency, within the crew concept. A line-oriented check ride takes place every six months for the pilot as a proficiency check. There are advantages and disadvantages to this program. One disadvantage is that since it is designed as a check-ride, the scenarios must be structured so that the average pilot will complete the check-ride without complication. This system is different from a proficiency check which can be stopped at a problem area so training to proficiency can take place before proceeding with the check. A.R.H.

N82-13129*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DELTA AIRLINES LOFT TRAINING
Jay Whitehead *In its* Guidelines for Line-oriented Flight Training, Vol. 2 1981 p 79-91 (For primary document see N82-13123 04-03)
Avail: NTIS HC A08/MF A01 CSCL 05I

A LOFT program was developed as part of the DC-9 training program which serves as a prototype for much of Delta's other aircraft training programs. The LOFT used differs little from the ideology presented in the Advisory Circular. Difficulty and experienced concerns regarding the effectiveness of LOFT as a complete training vehicle are explored. A.R.H.

N82-13130*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AMERICAN AIRLINES LOFT EVALUATION PROGRAM
Don Jensen *In its* Guidelines for Line-oriented Flight Training, Vol. 2 1981 p 92-102 (For primary document see N82-13123 04-03)
Avail: NTIS HC A08/MF A01 CSCL 05I

The development of a test program to evaluate recurrent training LOFT and a three-legged scenario used for the evaluation are highlighted. The test guidelines set up and the questionnaires sent to crew member participants are examined. A.R.H.

N82-13131*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GROUP 1: SCENARIO DESIGN AND DEVELOPMENT ISSUES
Peter Sherwin *In its* Guidelines for Line-oriented Flight Training, Vol. 2 1981 p 113-117 (For primary document see N82-13123 04-03)
Avail: NTIS HC A08/MF A01 CSCL 05I

All LOFT scenarios and flight segments should be designed on the basis of a detailed statement of specific objectives. These objectives must state what kind of situation is to be addressed and why. The origin, routing, and destination of a particular scenario should be dictated by the specific objectives for that scenario or leg. Other factors to be considered are the desired weather, climate, etc. Simulator visual system, as well as other capabilities and limitations must be considered at a very early stage of scenario design. The simulator navigation area must be apropriate and must coincide with current Jeppeson charts. Much of the realism of LOFT is destroyed if the crew is unable to use current manuals and other materials. A.R.H.

N82-13132*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GROUP 2: REAL TIME LOFT OPERATIONS
Dale Cavanagh *In its* Guidelines for Line-oriented Flight Training, Vol. 2 1981 p 118-126 (For primary document see N82-13123 04-03)
Avail: NTIS HC A08/MF A01 CSCL 05I

All LOFT scenarios should be constructed so as to provide the highest degree of realism that is economically, technically, and operationally feasible. The more realistic the situation, the faster the crew will adjust their thinking and provide reactions which would be typical of a line-flight orientation. The goal is to produce crew performance which would be typical of a crew on an actual line flight, given the same set of circumstances that were developed during the scenario. The briefing which is provided to the crew before entering the simulator for LOFT, the trip papers, the communications throughout the flight, the role played by the instructor, and so on, are important factors, crucial to the establishment and maintenance of a high degree of realism. Crews should have all manuals and other required equipment for a normal line-flight. A.R.H.

N82-13133*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GROUP 3: PERFORMANCE EVALUATION AND ASSESSMENT
Al Frink *In its* Guidelines for Line-oriented Flight Training, Vol. 2 1981 p 122-126 (For primary document see N82-13123 04-03)
Avail: NTIS HC A08/MF A01 CSCL 05I

Line-oriented flight training provides a unique learning

experience and an opportunity to look at aspects of performance other types of training did not provide. Areas such as crew coordination, resource management, leadership, and so forth, can be readily evaluated in such a format. While individual performance is of the utmost importance, crew performance deserves equal emphasis, therefore, these areas should be carefully observed by the instructors as an rea for discussion in the same way that individual performane is observed. To be effective, it must be accepted by the crew members, and administered by the instructors as pure training-learning through experience. To keep open minds, to benefit most from the experience, both in the doing and in the follow-on discussion, it is essential that it be entered into with a feeling of freedom, openness, and enthusiam. Reserve or defensiveness because of concern for failure must be inhibit participation. A.R.H.

N82-13134*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

GROUP 4: INSTRUCTOR TRAINING AND QUALIFICATIONS

Ron Sessa *In its* Guidelines for Line-oriented Flight Training, Vol. 2 1981 p 127-135 (For primary document see N82-13123 04-03)

Avail: NTIS HC A08/MF A01 CSCL 05I

Each professional instructor or check airman used in LOFT training course should complete an FAA approved training course in the appropriate aircraft type. Instructors used in such courses need not be type-rated. If an instructor or check airman who is presently not line-qualified is used as a LOFT instructor, he or she should remain current in line-operational procedures by observing operating procedures from the jump seat on three typical line segments pr 90 days on the appropriate aircraft type. ('Line qualification' means completion as a flight crew member of at least three typical line segments per 90 days on the appropriate aircraft type.) The training should include the requirement of four hours of LOFT training, in lieu of actual aircraft training or line operating experience. A.R.H.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

No abstracts in this category.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-13135# SCI Systems, Inc., Huntsville, Ala.

TECHNIQUES FOR INTERFACING MULTIPLEX SYSTEMS Final Report, 10 Sep. 1979 - 10 May 1980

James P. Gross Feb. 1981 138 p

(Contract F33615-79-C-1878; AF Proj. 2003)

(AD-A101457; AFWAL-TR-80-1223) Avail: NTIS HC A07/MF A01 CSCL 17/2

Data describing the characteristics of a number of aircraft multiplex systems were collected and compiled. Although Air Force aircraft received priority, were consideration was also given to other military and commercial aircraft. The F-16, B-52 OAS, YAH-64, F-18, F-15 and ARINC 575 systems were included. MIL-STD-1553B was used as a baseline for comparison. The compiled data was analyzed to determine points of incompatibility between these systems and a feasibility study was performed to assess possible techniques to be used in achieving bus compatibility. A programmable interface module design philosophy is recommended which utilizes a distributed three-microprocessor arrangement to achieve the desired interface compatibility. The three-processor conept allows three independent software-controlled events to occur simultaneously, thus providing an extremely high degree of flexibility both for existing systems and for future growth. Author

N82-13136# Institute for Defense Analyses, Arlington, Va. *Program Analysis Div.*

HELICOPTER RELIABILITY AND MAINTAINABILITY TRENDS DURING DEVELOPMENT AND PRODUCTION Final Report

Norman J. Asher, Lee L. Douglas, and Ray H. Jakobovits Jul. 1981 279 p refs Revised

(Contract MDA903-79-C-0320)

(AD-A105775; AD-E500409; IDA/HQ-81-23636) Avail: NTIS HC A13/MF A01 CSCL 01/3

This study updates and extends IDA Study S-451, 'Changes in Helicopter Reliability/Maintainability Characteristics Over Time,' dated March 1975. This study presents more recent data and, based on the combined data of both studies, summarizes the observed helicopter R&M trends. Trends observed during the development phase are compared with those of the production phase. GRA

N82-13137# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Drehfluegler und Verkehr.

SYSTEM IDENTIFICATION HELICOPTER PARAMETERS. DETERMINATION FROM FLIGHT TESTS, PHASE 2 [SYSTEMIDENTIFIZIERUNG DREHFLUEGLER KENNWERT-ERMITTLUNG AUS FLUGMESSUNGEN (PHASE 2)]

M. Kloster and S. Attlfellner Bonn Bundesministerium der Verteidigung 1980 92 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung

(BMVg-FBWT-80-12) Avail: NTIS HC A05/MF A01; DOK-ZENTw, Bonn DM 30

A parameter identification program for a hingeless rotor helicopter is considered. Flight conditions were selected with increasing instability, i.e., hover and level flight at maximum speed; with maximum weight and with a rearward center of gravity. A strap down system was chosen to provide the attitude feedback control necessary for proper identification. The control input signals were optimized for the unstabilized helicopter. Calculations in the time and frequency domains show that special distributions in the power spectrum of the input signals are needed for optimizing the closed loop system. The identified derivatives and the smoothened time histories from flight tests are compared with the identification results of linear and nonlinear simulations and of the quasistatic theory. Author (ESA)

N82-13138# Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).

MANEUVER LOAD CONTROL FOR THE REDUCTION OF DESIGN LOADS AND IMPROVEMENT OF THE MANEUVERABILITY OF MODERN FIGHTER AIRCRAFT

Horst Balke Bonn Bundesministerium der Verteidigung 1981 283 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung

(BMVg-FBWT-81-2) Avail: NTIS HC A13/MF A01; DOK-ZENTBw, Bonn DM 50

Active control technology is applied and the feasibility of design load reduction is analyzed. The influence of direct force control on aircraft component loads and on aircraft maneuverability is seen. The deflection of secondary control surfaces in proportion with the commanded control surface was investigated in an open loop control system. Load reduction efficiency diagrams and tables are presented. A comparison of two different aircraft shows that with an open loop control system a considerable reduction in design load is possible. The loads acting on several aircraft components for different open loop control systems are compared. Several closed loop control systems with aircraft response feedback parameters were also investigated. The results are again presented as diagrams, and tables. Only in some cases

does closed loop control achieve better results than open loop control. The best design load reduction is achieved with a combined open and closed loop control system. The investigation results are comprehensively evaluated and the parameters relevant for design load reduction are summarized. Author (ESA)

N82-13139 *Air Force Systems Command, Wright-Patterson AFB, Ohio.* Foreign Technology Div.
RAVEN AIRCRAFT FILTER-ABSORBER
Jerzy Chojnacki 26 Nov. 1980 5 p Transl. into ENGLISH from Skrzydlata Polska (Poland), Vol. 1, no. 51-52, 1979 p 7
(AD-A098962; FTD-ID(RS)T-2017-80) HC A02/MF A01 CSCL 06/11

A filter-absorber in the shape of a rectangular box and weighing 9.5 kg is mounted outside the cockpit of an agricultural aircraft. Toxic compounds given off during crop spraying are trapped by internal filters. The first, or forward filter has Anilana fibers. The second, or actual purification filter, is made from fiberglass which absorbs the finest airborne contaminants. The pesticide filter-absorber device is guaranteed for 100 hours of operation and was designed for use in Africa. A.R.H.

N82-13057# Smiths Industries Ltd., Bishops Cleeve (England). Aerospace and Defence Systems.
COMMAND-RESPONSE DATA TRANSMISION TO MECHANICAL SYSTEMS MANAGEMENT EFFECT ON THE CREW/SYSTEM INTERFACE
I. Moir (British Aerospace Aircraft Group) C. Moxey and P.A. Lancaster (British Aerospace Aircraft Group) In AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 12 p (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

N82-13064# McDonnell Aircraft Co., St. Louis, Mo.
F/A 18 HORNET CREW STATION
Eugene C. Adam *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 6 p (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

N82-13074# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Flugzeuge.
THE DESIGN AND DEVELOPMENT OF THE TORNADO ENGINE AIR INTAKE
C. P. Stocks (British Aerospace, Warton, England) and N. C. Bissinger *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 21 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13092# British Aerospace Aircraft Group, Hertfordshire (England). Research Dept.
THE INFLUENCE OF CLOSED-COUPLED, REAR FUSELAGE MOUNTED NACELLES ON THE DESIGN OF AN ADVANCED HIGH SPEED WING
R. D. Laugher *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 17 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13097# Douglas Aircraft Co., Inc., Long Beach, Calif.
PROP-FAN INTEGRATION AT CRUISE SPEEDS
H. Robert Welge *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 14 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N82-13140*# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
PRACTICAL ASPECTS OF INSTRUMENTATION SYSTEM INSTALLATION, VOLUME 13
R. W. Borek, A. Pool, ed., and K. C. Sanderson, ed. Sep. 1981 197 p refs
(NASA-TM-84067; AGARD-AG-160-Vol-13; ISBN-92-835-1399-1) Avail: NTIS HC A09/MF A01 CSCL 01D

A review of factors influencing installation of aircraft flight test instrumentation is presented. Requirements, including such factors as environment, reliability, maintainability, and system safety are discussed. The assessment of the mission profile is followed by an overview of electrical and mechanical installation factors with emphasis on shock/vibraion isolation systems and standardization of the electric wiring installation, two factors often overlooked by instrumentation engineers. A discussion of installation hardware reviews the performance capabilities of wiring, connectors, fuses and circuit breakers, and a guide to proper selections is provided. The discussion of the installation is primarily concerned with the electrical wire routing, shield terminations and grounding. Also inclued are some examples of installation mistakes that could affect system accuracy. System verification procedures and special considerations such as sneak circuits, pyrotechnics, aircraft antenna patterns, and lightning strikes are discussed. M.D.K.

N82-13141# General Electric Co., Binghamton, N.Y. Aircraft Equipment Div.
ELECTRONIC MASTER MONITOR AND ADVISORY DISPLAY SYSTEM TEST AND DEMONSTRATION REPORT Interim Report, Jan. - Jun. 1981
Jun. 1981 52 p
(Contract DAAK80-79-C-0270)
(AD-A105317; ACS-12388; AVRADCOM-TR-79-0270-5; IR-5)
Avail: NTIS HC A04/MF A01 CSCL 01/4

The hardware and software of the electronic master monitor and advisory display system are tested. The results are documented and the feasibility of the system is demonstrated. Author

N82-13049# Textron Bell Helicopter, Fort Worth, Tex. Human Factors and Cockpit Arrangement Group.
HOW THE HELICOPTER COCKPIT DESIGNER USES DIGITAL AVIONICS
John H. Emery *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 13 p ref (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

N82-13050# Smiths Industries Ltd., Bishops Cleeve (England). Aerospace and Defense Systems.
ELECTRONIC FLIGHT DECK DISPLAYS FOR MILITARY TRANSPORT AIRCRAFT
R. A. Chorley *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 12 p refs (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

N82-13051# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Directorate of Avionics Engineering.
COLOR CRT DISPLAYS FOR THE COCKPIT
Harry L. Waruszewski *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 22 p refs (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

N82-13052# Thomson-CSF, Paris (France).
HEAD UP DISPLAYS
Claude Maureau *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 7 p (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

N82-13054# Collins Radio Co., Cedar Rapids, Iowa. Government Avionics Div.
A STANDARD CONTROL DISPLAY UNIT FOR MULTI-AIRCRAFT APPLICATION
Ronald L. Swanson and Craig R. Scougton *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 10 p (For primary document see

N82-13048 04-01)
Avail: NTIS HC A10/MF A01

N82-13056# Crouzet Aerospace and Systems, Valence (France).
USING VOICE CONTROL ONBOARD COMBAT AIRCRAFT [UTILISATION DE LA COMMANDE VOCALE A BORD DES AERONEFS DE COMBAT]
J. R. Coster and J. M. Melocco *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpits Design Aug. 1981 5 p In FRENCH (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

N82-13059# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France).
MONOCULAR VISION AND TACTICAL FLIGHT ON THE HELICOPTER [VISION MONOCULAIRE ET VOL TACTIQUE SUR HELICOPTERE]
J. P. Papin, J. P. Menu, and G. Santucci *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 14 p refs In FRENCH (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

N82-13060# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.
EXPERIMENTAL INVESTIGATION OF A HELMET MOUNTED SIGHT/DISPLAY FOR HELICOPTER
R. Beyer, E. Danneberg, E. Kohnen, and H. Stein *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 11 p (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

N82-13061# Royal Aircraft Establishment, Farnborough (England). Flight Systems Dept.
USE OF A HELMET-MOUNTED MATRIX DISPLAY FOR PRESENTING ENERGY-MANEUVERABILITY INFORMATION DURING SIMULATED CLOSE COMBAT
D. N. Jarrett *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 10 p refs (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

N82-13063# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
TANKER AVIONICS AND AIRCREW COMPLEMENT EVALUATION
Richard W. Moss and Gregory J. Barbato (Bunker-Ramo Corp., Dayton, Ohio) *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 18 p refs (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N82-13142*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NUMERICAL ANALYSIS OF THE SCRAMJET-INLET FLOW FIELD BY USING TWO-DIMENSIONAL NAVIER-STOKES EQUATIONS
Ajay Kumar Dec. 1981 30 p refs
(NASA-TP-1940; L-14776) Avail: NTIS HC A03/MF A01 CSCL 21E

A computer code was developed to solve the full two dimensional Navier-Stokes equations in a supersonic combustion ramjet (scramjet) inlet. In order to be able to consider a general inlet geometry with embedded bodies, a numerical coordinate transformation is used which generates a set of boundary-fitted curvilinear coordinates. The explicit finite difference algorithm of MacCormack is used to solve the governing equations. An algebraic, two-layer eddy-viscosity model is used for the turbulent flow. The code can analyze both inviscid and viscous flows with no strut, one strut, or multiple struts in the flow field. The application of the two dimensional analysis in the preliminary parametric design studies of a scramjet inlet is discussed. Detailed results are presented for one model problem and for several actual scramjet-inlet configurations. R.J.F.

N82-13143*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF FUEL-AIR-RATIO NONUNIFORMITY ON EMISSIONS OF NITROGEN OXIDES
Valerie J. Lyons Nov. 1981 14 p refs
(NASA-TP-1798; E-648) Avail: NTIS HC A02/MF A01 CSCL 21E

The inlet fuel-air ratio nonuniformity is studied to deterine how nitrogen oxide (NOx) emissions are affected. An increase in NOx emissions with increased fuel-air ratio nonuniformity for average equivalence ratios less than 0.7 and a decrease in NOx emissions for average equivalence ratios near stoichiometric is predicted. The degree of uniformityy of fuel-air ratio profiles that is necessary to achieve NOx emissions goals for actual engines that use lean, premixed, prevaporized combustion systems is determined. S.L.

N82-13144*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A REAL TIME PEGASUS PROPULSION SYSTEM MODEL FOR VSTOL PILOTED SIMULATION EVALUATION
James R. Mihaloew, Stephen P. Roth (Pratt and Whitney Aircraft Group, West Palm Beach, Fla.), and Robert Creekmore (Pratt and Whitney Aircraft Group, West Palm Beach, Fla.) 1981 18 p refs Presented at VSTOL Conf., Palo Alto, Calif., 7-9 Dec. 1981; sponsored by AIAA and NASA. Ames Research Center (NASA-TM-82770; E-1004; AIAA-81-2663) Avail: NTIS HC A02/MF A01 CSCL 21E

A real time propulsion system modeling technique suitable for use in man-in-the-loop simulator studies was developed. This technique provides the system accuracy, stability, and transient response required for integrated aircraft and propulsion control system studies. A Pegasus-Harrier propulsion system was selected as a baseline for developing mathematical modeling and simulation techniques for VSTOL. Initially, static and dynamic propulsion system characteristics were modeled in detail to form a nonlinear aerothermodynamic digital computer simulation of a Pegasus engine. From this high fidelity simulation, a real time propulsion model was formulated by applying a piece-wise linear state variable methodology. A hydromechanical and water injection control system was also simulated. The real time dynamic model includes the detail and flexibility required for the evaluation of critical control parameters and propulsion component limits over a limited flight envelope. The model was programmed for interfacing with a Harrier aircraft simulation. Typical propulsion system simulation results are presented. M.D.K.

N82-13145*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.
SENSOR FAILURE DETECTION SYSTEM Final Report
E. C. Beattie, R. F. LaPrad, M. E. McGlone, S. M. Rock, and M. M. Akhter Aug. 1981 172 p refs Prepared in cooperation with Systems Control, Inc., Palo Alto, Calif.
(Contract NAS3-22481)
(NASA-CR-165515; PWA-5736-17) Avail: NTIS HC A08/MF A01 CSCL 21E

Advanced concepts for detecting, isolating, and accommodating sensor failures were studied to determine their applicability to the gas turbine control problem. Five concepts were formulated based upon such techniques as Kalman filters and a screening process led to the selection of one advanced concept for further evaluation. The selected advanced concept uses a Kalman filter to generate residuals, a weighted sum square residuals technique to detect soft failures, likelihood ratio testing of a bank of Kalman filters for isolation, and reconfiguring of the normal mode Kalman

filter by eliminating the failed input to accommodate the failure. The advanced concept was compared to a baseline parameter synthesis technique. The advanced concept was shown to be a viable concept for detecting, isolating, and accommodating sensor failures for the gas turbine applications. M.G.

N82-13146*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NASA RESEARCH IN AIRCRAFT PROPULSION
Milton A. Beheim 1982 17 p Proposed for presentation at the 27th Ann. Intern. Gas Turbine Conf., London, 18-22 Apr. 1982; sponsored by ASME
(NASA-TM-82771; E-1096) Avail: NTIS HC A02/MF A01 CSCL 21E

A broad overview of the scope of research presently being supported by NASA in aircraft propulsion is presented with emphasis on Lewis Research Center activities related to civil air transports, CTOL and V/STOL systems. Aircraft systems work is performed to identify the requirements for the propulsion system that enhance the mission capabilities of the aircraft. This important source of innovation and creativity drives the direction of propulsion research. In a companion effort, component research of a generic nature is performed to provide a better basis for design and provides an evolutionary process for technological growth that increases the capabilities of all types of aircraft. Both are important. A.R.H.

N82-13055# British Aerospace Aircraft Group, Preston (England). Military Aircraft Div.
DEVELOPMENT OF A MINIATURISED DIGITAL THRUST DEMAND UNIT
Arthur Kaye *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 10 p (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

N82-13075# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
INTEGRATION OF ADVANCED EXHAUST NOZZLES
Douglas L. Bowers and James A. Laughrey *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 14 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13076# Rolls-Royce Ltd., Bristol (England). Installation Aerodynamics Group.
THE SUBSONIC PERFORMANCE OF PRACTICAL MILITARY VARIABLE AREA CONVERGENT NOZZLES
L. R. Harper IN AGARD Aerodyn. of Power Plant Installation Sep. 1981 11 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13077# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
COMPARISON OF DIFFERENT NOZZLE CONCEPTS FOR A REHEATED TURBOFAN
H. Grieb, R. Vedova, H. Enderle, and H. Nagel *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 15 p refs Sponsored in part by German Ministry of Defence (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13078# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Aero Propulsion Lab.
ADVANCED EXHAUST NOZZLE TECHNOLOGY
Ronald J. Glidewell and Robert E. Warburton (Pratt and Whitney Aircraft Group, West Palm Beach, Fla.) *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 11 p refs (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13079# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
A NUMERICAL INVESTIGATION OF EXHAUST PLUME TEMPERATURE EFFECTS ON NONAXISYMMETRIC NOZZLE/AFTERBODY PERFORMANCE
K. M. Peery (Boeing Military Airplane Co., Seattle) and D. L. Russell *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 11 p refs (For primary document see N82-13065 04-01) (Contract F33615-79-C-3018)
Avail: NTIS HC A22/MF A01

N82-13081# Societe Nationale d'Etudes et de Construction de Moteurs d'Aviation, Moissy-Cramayel (France).
A DEVICE FOR SIMULATING AT A COMPRESSOR BENCH AN AIR INLET WITH LARGE INCIDENCE [DISPOSITIF DE SIMULATION AU BANC COMPRESSEUR D'UNE PRISE D'AIR A GRANDE INCIDENCE]
Bertrand Delahaye and Gerard Laruelle (ONERA, Chatillon, France) *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 15 p refs In FRENCH; ENGLISH summary (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13082# Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France).
AN ACQUISITION AND ANALYSIS SYSTEM FOR DYNAMIC TESTS OF AIR INLETS [SYSTEME D'ACQUISITION ET D'ANALYSE POUR ESSAIS DYNAMIQUES D'ENTREES D'AIR]
Pierre Perrier, Bertrand Delahaye (SNWCMA, Moissy Cramayel, France), and Gerard Laruelle (ONERA, Chatillon, France) *In* AGARD Aerodyn. of Power Plant Installation Aug. 1981 14 p refs In FRENCH (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13085# National Defence Headquarters, Ottawa (Ontario). Directorate of Science and Technology.
COMPRESSOR STALL INDUCING INSTALLATION EFFECTS OF AN ENGINE CONTROL PARAMETER FOR THE CF-5 AIRCRAFT
W. L. Macmillan, D. M. Rudnitski, and W. Grabe *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 17 p Prepared in cooperation with National Research Council of Canada, Ottawa (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

N82-13087# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
WIND TUNNEL TESTS OF POWERED MODELS: A COMPARISON OF TWO METHODS OF SIMULATING THE JETS OF JET ENGINES [ESSAIS EN SOUFFLERIE DE MAQUETTES MOTORISEES; COMPARAISON DE DEUX METHODES DE SIMULATION DES JETS DES REACTEURS]
J. P. Becle and R. Perin (SNIAS, Toulouse) *In* AGARD Aerodyn. of Power Plant Installation Sep. 1981 18 p ref In FRENCH (For primary document see N82-13065 04-01)
Avail: NTIS HC A22/MF A01

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N82-13147*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
DESIGN FOR ACTIVE AND PASSIVE FLUTTER SUPPRESSION AND GUST ALLEVIATION Ph.D. Thesis
Mordechay Karpel Washington NASA Nov. 1981 117 p refs
(Grant NGL-05-020-243)
(NASA-CR-3482) Avail: NTIS HC A06/MF A01 CSCL 01C

Analytical design techniques for active and passive control of aeroelastic systems are based on a rational approximation of the unsteady aerodynamic loads in the entire Laplace domain, which yields matrix equations of motion with constant coefficients. Some existing schemes are reviewed, the matrix Pade approximant is modified, and a technique which yields a minimal number of augmented states for a desired accuracy is presented. The state-space aeroelastic model is used to design an active control

system for simultaneous flutter suppression and gust alleviation. The design target is for a continuous controller which transfers some measurements taken on the vehicle to a control command applied to a control surface. Structural modifications are formulated in a way which enables the treatment of passive flutter suppression system with the same procedures by which active control systems are designed. A.R.H.

N82-13148*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LIMITED EVALUATION OF AN F-14A AIRPLANE UTILIZING AN AILERON-RUDDER INTERCONNECT CONTROL SYSTEM IN THE LANDING CONFIGURATION
Wendell W. Kelley and Einar K. Enevoldson (NASA. Dryden Flight Research Center) Dec. 1981 39 p refs
(NASA-TM-81972; L-14756) Avail: NTIS HC A03/MF A01 CSCL 01C

A flight test was conducted for preliminary evaluation of an aileron-rudder interconnect (ARI) control system for the F-14A airplane in the landing configuration. Two ARI configurations were tested in addition to the standard F-14 flight control system. Results of the flight test showed marked improvement in handling qualities when the ARI systems were used. Sideslip due to adverse yaw was considerably reduced, and airplane turn rate was more responsive to pilot lateral control inputs. Pilot comments substantiated the flight data and indicated that the ARI systems were superior to the standard control system in terms of pilot capability to make lateral offset corrections and heading changes on final approach. Author

N82-13149*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
ANALYSIS OF A LONGITUDINAL PILOT-INDUCED OSCILLATION EXPERIENCED ON THE APPROACH AND LANDING TEST OF THE SPACE SHUTTLE
John W. Smith Dec. 1981 45 p refs
(NASA-TM-81366) Avail: NTIS HC A03/MF A01 CSCL 05H

During the final free flight (FF-5) of the shuttle's approach and landing tests, the vehicle experienced pilot-induced oscillations near touchdown. The light test data showed that pilot inputs to the hand controller reached peak-to-peak amplitudes of 20 deg at a frequency between 3 and 3.5 radians per second. The controller inputs were sufficient to exceed the priority rate limit set in the pitch axis. A nonlinear analytical study was conducted to investigate the combined effects of pilot input, rate limiting, and time delays. The frequency response of the total system is presented parametrically as a function of the three variables. In general, with no dead time, for controller inputs of 5 deg or less, the total system behaves in a linear fashion. For 10 deg of controller input, independent of the delay time, the elevon loop will be rate saturated above a frequency of 4 radians per second. Author

N82-13150*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
INTERACTIVE AIRCRAFT FLIGHT CONTROL AND AEROELASTIC STABILIZATION Interim Report
Terrence A. Weisshaar and David K. Schmidt 31 Oct. 1981 39 p refs
(Grant NAG1-157)
(NASA-CR-165036) Avail: NTIS HC A03/MF A01 CSCL 01C

Several examples are presented in which flutter involving interaction between flight mechanics modes and elastic wind bending occurs for a forward swept wing flight vehicle. These results show the basic mechanism by which the instability occurs and form the basis for attempts to actively control such a vehicle. A.R.H.

N82-13053# Army Avionics Research and Development Activity, Fort Monmouth, N. J.
INTEGRATION OF CONTROLS AND DISPLAYS IN US ARMY HELICOPTER COCKPITS
J. A. Dasaro and C. T. Elliott *In* AGARD The Impacts of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 19 p refs (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N82-13151# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
ON A DUSTY-GAS SHOCK TUBE
H. Miura (Osaka Prefecture, Japan) and I. I. Glass May 1981 80 p refs Sponsored in part by Natural Sciences and Engineering Research Council of Canada, U.S. Army, and Defence Research Establishment, Suffield
(Grant AF-AFOSR-3303-77)
(UTIAS-250; CN-ISSN-0082-5255) Avail: NTIS HC A05/MF A01

Analytical and numerical methods were used to investigate the flow induced by a shock wave in a shock-tube channel containing air laden with suspended small solid particles. Exact results are given for the frozen and equilibrium shock wave properties as a function of diaphragm-pressure ratio and shock-wave Mach numbers. The driver contained air at high pressure. A modified random-choice method together with an operator-splitting technique show the decay of a discontinuous frozen shock wave, a contact discontinuity, formation of a stationary shock structure, and an effective contact front of finite thickness. The effects of particle diameter, particle-number density, and diaphragm-pressure ratio on the transitional behavior of the flow are investigated in detail. The alteration of flow properties due to the presence of particles is discussed in detail and compared with classical shock-tube flows. Author

N82-13152# State Univ. of New York, Albany. Dept. of Chemistry.
CONSTRUCTION AND MAINTENANCE OF SUNY FACILITIES AT THE NATIONAL SYNCHROTRON LIGHT SOURCE Progress Report, 1 Oct. 1980 - 30 Sep. 1981
Jacob Bigeleisen, Philip Coppens, and Peter Stephens 1981 20 p refs
(Contract DE-AC02-80ER-10759)
(DE81-027855; DOE/ER-10759/1) Avail: NTIS HC A02/MF A01

The research program is described, including/synchrotron radiation/beamline construction, equipment acquisitions, and synchrotron experiments. Beamline components including the monochromator and mirror system, experimental and control equipment, and the computer system are discussed. DOE

N82-13153# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Inst. fuer Flugmedizin.
RESULTS AND EXPERIENCE WITH A SMALL MULTIPURPOSE TRACKING SIMULATOR [ERGEBNISSE UND ERFAHRUNGEN MIT EINEM KLEINSIMULATOR FUER TRACKING- UND MEHRFACHARBEITSUNTERSUCHUNGEN]
S. Fichtbauer 1980 33 p refs In GERMAN; ENGLISH Summary Presented at 12th Conf. of the West European Soc. for Aviation Psychology, Kollekolle, Denmark, 24-28 Sep. 1979
Avail: NTIS HC A03/MF A01

The performance results on three prototype tracking simulators are reported, compared and supplemented by a factor analytical study. Test results on motor coordination and on performance under multiple-tasks conditions are discussed. The performance structure analysis reveals a five-factors solution with interpretation as to error, numerical thinking, observation speed, spatial relations recoptivity, and psychomotor coordination. Its relation to other psychomotor apparatus tests used in pilot selection is discussed. Author (ESA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N82-13154*# Westinghouse Research and Development Center, Pittsburgh, Pa.
A PRELIMINARY ANALYSIS OF THE DATA FROM EXPERIMENT 77-13 AND FINAL REPORT ON GLASS FINING EXPERIMENTS IN ZERO GRAVITY Final Report
W. R. Wilcox, R. S. Subramanian (Clarkson Coll., Potsdam, N.Y.), M. Meyyappan (Clarkson Coll., Potsdam, N.Y.), H. D. Smith, D. M. Mattox, and D. P. Partlow [1981] 64 p refs
(Contract NAS8-33017)
(NASA-CR-161884) Avail: NTIS HC A04/MF A01 CSCL 22A

Thermal fining, thermal migration of bubbles under reduced gravity conditions, and data to verify current theoretical models of bubble location and temperatures as a function of time are discussed. A sample, sodium borate glass, was tested during 5 to 6 minutes of zero gravity during rocket flight. The test cell contained a heater strip; thermocouples were in the sample. At present quantitative data are insufficient to confirm results of theoretical calculations. M.D.K.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N82-13155# Virginia Polytechnic Inst. and State Univ., Blacksburg.
REGULARIZED INTEGRATION OF GRAVITY-PERTURBED TRAJECTORIES: A NUMERICAL EFFICIENCY STUDY
L. Glenn Kraige, J. L. Junkins, and L. D. Ziems Nov. 1980 221 p refs Backup document for AIAA synoptic scheduled for publication in Journal of Spacecraft and Rockets on Jan./Feb. 1982
Avail: NTIS HC A10/MF A01

It was demonstrated that regularizing transformations can form the basis of highly efficient trajectory approximations. Eight algorithms for predicting the motion of a particle in a perturbed gravity field were brought to final completion for comparison with the Naval Surface Weapons Center Vacuum program. Several methods were found to be more efficient than the Vacuum Encke solution for the cases tested, particularly the Eulr parameter asymptotic expansion, the KS Cowell, the KS Encke, and the Rectangular Encke methods. All but the latter can be characterized as regularized methods. Several of the methods would become even more efficient (relative to Cowell integration schemes) for spacecraft in higher and/or less eccentric trajectories or orbits than the trajectories tested. Three algorithms for the solution of the Lambert problem were developed. Over the twelve cases studies, a straightforward differential correction scheme coupled with the Rectangular Encke motion predictor proved to be more efficient than a more analytical KS Variation of Parameters Approach. N.W.

N82-13156# Defence Research Establishment, Ottawa. (Ontario). Defence Electronics Div.
SEASAT EQUATOR CROSSING PROGRAM
B. G. Young and D. L. Desaulniers Jun. 1980 31 p refs
(AD-A099442; DREO-TN-80-19) Avail: NTIS HC A03/MF A01 CSCL 09/2

A programmable pocket calculator is used to extrapolate the Seasat orbit from the equator crossing to the position at which the synthetic aperture radar images a given target. The coordinates of the satellite at image time, the Azimuth direction of the image at the target, and the time elapsed between equator crossing and imaging are predicted. Predictions are compared with measured Seasat data from the definitive attitude-orbit files. Author

N82-13157# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.
EFFECTS OF THE SATELLITE POWER SYSTEM ON LOW EARTH ORBIT AND GEOSYNCHRONOUS SATELLITES
W. B. Grant, E. L. Morrison, and J. R. Juroshek Jun. 1981 86 p refs
(Contracts DE-AI06-79RL-10077; DE-AI01-80ER-10160)
(PB81-232019; NTIA/Rept-81/75) Avail: NTIS HC A05/MF A01 CSCL 22A

The large amount of power contained in the main beam and principal sidelobes of the proposed Solar Power System (SPS), now under study by DOE and NASA, potentially presents an EMC problem for other satellite systems. This report examines selected geosynchronous orbit (GEO) satellites in adjacent slots to an SPS, GEO satellites on a chord passing an Earth horizon, and low-earth-orbit (LEO) satellites which may pass throught the SPS power beam. Potential functional and operational impacts to on-board systems are analyzed. Mitigation techniques for SPS effects are examined, and recommendations summarized to allow satellites to operate satisfactorily in an SPS environment. GRA

N82-13158 Purdue Univ., Lafayette, Ind.
CONTROL DESIGN FOR PARAMETER SENSITIVITY REDUCTION IN LINEAR REGULATORS: APPLICATION TO LARGE FLEXIBLE SPACE STRUCTURES Ph.D. Thesis
RamaKrishna Yedavalli 1981 236 p
Avail: Univ. Microfilms Order No. 8123729

The problem of control design for linear systems having parameter uncertainty is addressed from two viewpoint: viewpoints to minimize or reduce the trajectory and/or performance cost dispersion from the nominal values in the presence of small variations in the system parameters, and to maintain some optimal or satisfactory level of performance in the presence of small variations in the system parameters subject to model/controller truncation. It is shown that the minimization of a modified performance index that includes a quadratic term of trajectory sensitivity (state, output or control) subject to the augmented sensitivity system dynamics causes reduction not only in trajectory sensitivity but also in cost sensitivity. The control of large flexible space structures where there is large uncertainty associated with the modal data and constraints on the controller order, model reduction is required before linear multivariable theory can be applied to design controllers. The preliminary step taken in this direction is to use the concepts of open loop 'modal cost analysis' to derive explicit analytical formulae for 'modal costs' and 'parameter costs' for specific performance objectives.
Dissert. Abstr.

N82-13159 Stanford Univ., Calif.
TECHNICAL BASIS FOR EFFICIENT MANAGEMENT OF GEOSTATIONARY SATELLITE ORBIT/SPECTRUM Ph.D. Thesis
Mohammad K. Samarkandy 1981 311 p
Avail: Univ. Microfilms Order No. 8124146

The technical factors for efficient and effective management of the orbit and radio frequency spectrum is established. Concepts of available isolation and required isolation between interfering satellites are introduced to solve inhomogeneous orbit congestion problems that arise between broadcasting and/or fixed satellite systems using different Earth station sizes and transmitting different modulating signals. Methods for reducing this interference are described that employ frequency coordination, polarization isolation, satellite beams separation, and modulation selection.
Dissert. Abstr.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N82-13160# Academia Sinica, Peking (China). Space Science and Technology Center.
SATELLITE ATTITUDE CONTROL WITH DECOMPOSED CONTROLLER
Yu. Shao-hua 1 Jul. 1981 22 p refs Backup document for AIAA synoptic scheduled for publication in Journal of Guidance and Control on Jan./Feb. 1982
(LOG-G668) Avail: NTIS HC A02/MF A01

A concept is presented to solve the gyroscopic coupling problem of satellite attitude control. Control theory is used in the problem formulation and solution. Optimal decoupling control, wheel momentum tracking, and stochastic correction control and estimation are features of the concept. The systems structure of the concept is recommended for various attitude control and estimation problems. The performance obtained from computer simulation showed potential for practical application. N.W.

N82-13161*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
LAUNCH MISSION SUMMARY: INTELSAT 5 (F3) ATLAS/CENTAUR-55
30 Nov. 1981 14 p refs
(NASA-TM-84068; KSC-GP-15-23) Avail: NTIS HC A02/MF A01 CSCL 22B

Intelsat 5 (F3) spacecraft, launch vehicle, and mission are described. Information relative to launch windows, flight plan, radar and telemetry coverage, selected trajectory information, and a brief sequence of flight events is provided. S.L.

N82-13162*# National Aeronautics and Space Administration, Washington, D. C.
MISSION OPERATION REPORT: INTELSAT V-C(F-3)
[1981] 22 p
(NASA-TM-84072; O-491-203-81-03) Avail: NTIS HC A02/MF A01 CSCL 22B

This third in a series of improved INTELSAT commercial communication satellites has a cpaa capacity of 12,000 voice circuits plus two television channels. An Atlas-Centaur vehicle inserts the satellite into a transfer orbit which enables the spacecraft apogee motor to inject the satellite into a synchronous orbit. The dimensions, general characteristics, and communications features are summarized. The maritime communications subsystems and the communications payload are described. Telemetry, tracking and command, propulsion, electric power, and the launch vehicle characteristics are also discussed. A.R.H.

N82-13163# Erprobungsstelle der Bundeswehr, Meppen (West Germany).
TRANSITIONAL BALLISTICS OF HYPERVELOCITY PROJECTILES
Joachim K. Biele Bonn Bundesministerium der Verteidigung 1980 57 p refs Partly in GERMAN and ENGLISH Sponsored by Bundesministerium der Verteidigung
(BMVg-FBWT-80-1) Avail: NTIS HC A04/MF A01; DOKZENTw, Bonn DM 30

The state of the art of transitional ballistics of hypervelocity fin-stabilized projectiles is described, particularly sabot launching from smoothbore guns. The influence of gun-tube vibration and aerodynamic jump on near-muzzle flight direction errors and dispersion is established whereas the gas dynamical effects are shown to be negligible. Detection techniques for gun-tube vibration are discussed and it is shown that muzzle contact and sabot separation induced trajectory perturbations can be observed by means of an electromechanical method, using (nontouching) inductive gages as well as strain gages. Results describing the firing of an 105 mm smoothbore tank gun are presented and analyzed for muzzle influence on free flight behavior.
Author (ESA)

N82-13164# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
CONCEPT AND FEASIBILITY STUDY (PHASE A) FOR THE X-RAY SATELLITE ROBISAT. EXECUTIVE SUMMARY Final Report
Gerhard Barthel, Wolfgang Brunner, Jochen Doenecke, Edelbert Eichhorn, Heinrich Hufnagel, Kent oKelly, Gert Leibold, Werner Nagl, Horst Richter, Ernst Sach et al Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 72 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-80-027; ISSN-0170-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15.10

The feasibility of launching a reusable satellite from a space shuttle which meets high performance characteristics connected with a one-year sky mapping mission of soft X-ray sources in the spectral range between 0.1 and 2.0 keV is studied. The core instrument of the satellite is an 80 cm Wolter telescope. Possible concept alternatives for the telescope, satellite design, orbit parameters, and telemetry are discussed. An optimized concept is presented and its integration and test program are indicated. The cost analysis indicates that this satellite can be built within the limits set by the low program cost requirements.
Author (ESA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

No abstracts in this category.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N82-13165# Harry Diamond Labs., Adelphi, Md.
TWO-CHANNEL TELEMETER FOR USE IN A 3-INCH SPIN AIR GUN
Floyd Allen Jun. 1981 22 p
(AD-A102566; HDL-TR-1961) Avail: NTIS HC A02/MF A01 CSCL 09/6

A special two-channel telemeter-projectile system designed and built for use in a 3-in. spin air gun is described. The system allows batteries to be tested at a far lower cost than field testing. The telemeter projectile is unusually gun rugged an reusable in a simulated artillery environment. Test-battery current and voltage is continuously monitored by subcarrier oscillators. The fuze simulator contains logic components for controlling the battery land program, rather than using steady-state loads for the full flight. This telemeter system has potential applications in remote voltage monitoring over long periods of time.
Author

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-13166*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SHAPE DETERMINATION AND CONTROL FOR LARGE SPACE STRUCTURES
Connie J. Weeks 1 Oct. 1981 175 p refs
(Contract NAS7-100)
(JPL-Pub-81-71) Avail: NTIS HC A08/MF A01 CSCL 22B

An integral operator approach is used to derive solutions to static shape determination and control problems associated with large space structures. Problem assumptions include a linear self-adjoint system model, observations and control forces at discrete points, and performance criteria for the comparison of estimates or control forms. Results are illustrated by simulations in the one dimensional case with a flexible beam model, and in the multidimensional case with a finite model of a large space antenna. Modal expansions for terms in the solution algorithms are presented, using modes from the static or associated dynamic mode. These expansions provide approximated solutions in the event that a used form analytical solution to the system boundary value problem is not available. Author

N82-13167# IRT Corp., San Diego, Calif.
CONDUCTION AND CHARGE STORAGE IN ELECTRON IRRADIATED SPACECRAFT INSULATORS Final Technical Report, Sep. 1977 - Sep. 1980
J. Wilkenfeld, C. Mallon, and J. Horne Griffiss AFB, New York RADC Jul. 1981 121 p refs
(Contract F19628-77-C-0245; AF Proj. 4600)
(AD-A104796; IRT-8172-008; RADC-TR-81-198) Avail: NTIS HC A06/MF A01 CSCL 22/2

Charge, storage and conduction processes were studies in four spacecraft insulators, FEP Teflon, Kapton, Mylar and fused quartz exposed to monoenergetic electron beams with energies of 5-27 keV as a function of particle flux, sample thickness, applied external bias and temperature. The experimental data was used to determine some of the parameters which control the deposition and transport of keV electrons in representative spacecraft insulators found on the surface of communication and other satellites placed in geostationary orbits. Properties determined include location of the charge deposition centroid, dark, radiation, delayed and surface conductivities. These parameters were then used in the phenomenological transport model to interpret the observed charge leakage behavior under various exposure conditions. In the model, the sample is divided into two regions. In the irradiated region, radiation-induced conductivity is the predominant conduction mechanism. In the nonirradiated region, space-charge limited currents predominate. Author (GRA)

N82-13168 Stanford Univ., Calif.
ON THE MODELING AND CONTROL OF FLEXIBLE SPACE STRUCTURES Ph.D. Thesis
Bong Wie 1981 216 p
Avail: Univ. Microfilms Order No. 8124171

The development of generic models of flexible space structures for control analysis and synthesis is discussed. Transfer functions with exact poles and zeros are derived for some simple generic models such as bars, beams, membranes, toroids, a triangular truss, and a triangular frame. In the first two models (bars and beams), transfer functions for the separated actuator and sensor pairs are also discussed. A comparison is made between the two lumped parameter transfer functions obtained by (1) truncating the exact partial fraction expansion, and (2) truncating the exact infinite product expansion of an infinite dimensional transfer function. The significance of near pole zero cancellations and inherent structural damping in designing control logic for infinite dimensional systems is shown. Attitude control of flexible space structures with an infinite number of vibration modes is investigated by using the exact infinite - dimensional transfer functions. Dissert. Abstr.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N82-13169# Fraunhofer Inst., Freiburg (West Germany).
JASPIC-DIP: THE DIGITAL IMPEDANCE PROBE IN THE JASPIC PROJECT Final Report
Eugen Neske and Josef Molnar Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 48 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-80-034; ISSN-0170-1339) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,10

A digital impedance probe (DIP) was developed to be used in the Joint American Soviet Particle Inter-Calibration (JASPIC) program. It is capable on the one hand of providing fast and reliable estimates of the electron density height profiles in the nocturnal ionosphere, and on the other hand, of delivering density data with high accuracy during the subsequent analysis. Two techniques were developed: (1) fast scanning automatic resonance detection, and (2) slow scanning frequency-magnitude transmission. Apparatus and electronics are described. Results of rocket-borne experiments indicate DIP to be superior to three other diagnostical techniques, or to be necessary for their calibration. Author (ESA)

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

No abstracts in this category.

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N82-13170# National Research Council of Canada, Ottawa (Ontario). Inst. for Scientific and Technical Information.
CONSTITUTION OF SILICATE ANIONS IN TETRAETHYLAMMONIUM SILICATES AND THEIR AQUEOUS SOLUTIONS
D. Hoebbel 1981 26 p refs Transl. into ENGLISH from Z. Anorg. Allg. Chem. (East Germany), no. 465, 1980 p 15-33
(NRC/CNR-TT-2004) Avail: NTIS HC A03/MF A01

Studies aided by paper chromatography, Si-29 NMR, and trimethylsilylation methods show that in concentrated tetraethyl ammonium silicate solutions with molar TEA:Si ratios of 2.8 to 1, for the most part double three-ring silicate anions are present, along with small concentrations of mono-, di-, tri-, tetra-, cyclotri-, cyclotetra-, double four-ring, and other polycyclic silicate anions. At low temperatures a double three-ring silicate with the formula [N(C2H5)4]6 [Si6O15].57H2O crystallizes out. Concentrated solutions with TEA:Si = 0.8 to 0.6 contain predominantly double three-, double four-, and probably also double six-ring silicate anions. From these solutions the TEA-double four-ring silicate

always crystallizes out. The possible reasons for the preferential formation of double-ring silicate anions in TEA-silicate solutions and their crystallization are discussed. Author

N82-13171*# Massachusetts Univ., Amherst. Dept. of Polymer Science and Engineering.
GRAFTING OF 2 (2-HYDROXY-5-VINYLPHENYL) 2H-BENZOTRIAZOLE ONTO POLYMERS WITH ALIPHATIC GROUPS. SYNTHESIS AND POLYMERIZATION OF 2 (2-HYDROXY-5-ISOPROPENYLPHENYL)
LE AND A NEW SYNTHESIS OF 2 (2-HYDROXY-5-VINYLPHENYL) 2H-BENZOTRIAZOLE Annual Report, 1980 - 1981
W. Pradellok, Zohar Nir, and Otto Vogl 15 Aug. 1981 30 p Prepared for JPL
(Contract JPL-955531)
(NASA-CR-165016; JPL-9950-608; DOE/JPL-955531-81/1)
Avail: NTIS HC A03/MF A01 CSCL 07C

Successful grafting of 2(2-hydroxy-5-vinylphenyl)2H-benzotriazole onto saturated aliphatic C-H groups of polymers has been accomplished. When the grafting reaction was carried out in chlorobenzene at 150 C = 160 C with di-tertiarybutylperoxide as the grafting initiator, grafts as high as 20 percent - 30 percent at a grafting efficiency of 50 percent and 80 percent have readily been obtained. The grafting reaction was carried out in tubes sealed under high vacuum since trace amounts of oxygen cause complete inhibition of the grafting reaction by the phenolic monomer. On a variety of different polymers including atactic polypropylene, ethylene/vinyl acetate copolymer, poly(methyl methacrylate), poly(butyl acrylate), and polycarbonate were used. A.R.H.

24 COMPOSITE MATERIALS

Includes laminates.

N82-13172 Georgia Inst. of Tech., Atlanta.
EFFECTS OF HYGROTHERMAL CONDITIONING ON THE DYNAMIC BEHAVIOR OF RESIN MATRIX COMPOSITES Ph.D. Thesis
Ronald Patrick Briley 1981 121 p
Avail: Univ. Microfilms Order No. 8124282

The effects of hostile, hygrothermal environments on the dynamic behavior of graphite/epoxy composites were investigated. Flexural vibration tests were performed on Narmco 5208/T300 beam specimens of four distinct layups. Dynamic behavior in the dry, room temperature state is contrasted with five other environmental states, including moisture saturation and temperatures up to 93 C. The properties determined are fundamental natural frequency and damping. The measured natural frequency is directly related to an effective dynamic modulus in flexure. These properties reflect the consequences of plasticization of the epoxy matrix material hydrothermal environments. The experimental results, after correction for parasitic damping contributions, are consistent with behavioral trends. The glass transition temperature for the material in its moisture saturated state appears to be between 82 C and 93 C which is somewhat lower than expected. Dissert. Abstr.

N82-13173 Virginia Polytechnic Inst. and State Univ., Blacksburg.
CREEP AND CREEP RUPTURE OF LAMINATED GRAPHITE/EPOXY COMPOSITES Ph.D. Thesis
David A. Dillard 1981 245 p
Avail: Univ. Microfilms Order No. 8121498

Graphite epoxy composite material exhibit creep and delayed failures. An incremental numerical procedure based on lamination theory was developed to predict creep and creep rupture of general laminates. Existing unidirectional creep compliance and delayed failure data were used to develop analytical models for lamina response. The compliance model is based on a procedure proposed by Findley which incorporates the power law for creep into a nonlinear constitutive relationship. The matrix octahedral shear stress is assumed to control the stress interaction effect. A modified superposition principle is used to account for the varying stress level effect on the creep strain. The lamina failure model is based on a modification of the Tsai-Hill theory which includes the time dependent creep rupture strength. A linear cumulative damage law is used to monitor the remaining lifetime in each ply. Creep compliance and delayed failure data are presented for several general laminates along with the numerical predictions. Dissert. Abstr.

N82-13280# Bath Univ. (England). School of Materials Science.
FATIGUE TESTING OF FIBRE COMPOSITES
Bryan Harris *In* AGARD Fatigue Test Methodology Oct. 1981 18 p refs (for primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

N82-13284# Bath Univ. (England). School of Materials Science.
MONITORING OF DAMAGE IN FIBRE COMPOSITES
Bryan Harris *In* AGARD Fatigue Test Methodology Oct. 1981 23 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N82-13174 Purdue Univ., Lafayette, Ind.
GAS TURBINE COMBUSTOR SOOT AND RADIATION Ph.D. Thesis
Jim Alan Clark 1981 197 p
Avail: Univ. Microfilms Order No. 8123652

Gas turbine combustor soot and radiation were studied using two distinct methods which depend on experimental measurements of soot concentration and flame radiation in a model gas turbine combustor. A strong empirical relationship between the primary zone radiation intensity and two fuel properties-percent hydrogen and percent polycyclic aromaticity was found. The effective hydrogen content was found to be the tendency of a fuel. The second study used temperature and soot concentration mappings of the combustor flowfield to make predictions of radiation intensity and emissivity of a DF-2 flame. A comparison of the predicted and measured intensities and emissivities showed agree poorly, and the lack of agreement was attributed to errors in soot mass concentration measurements. The radiative transfer equation was used to deduce the approximate average soot concentration, and from this deduction the magnitude of soot error was estimated. Dissert. Abstr.

N82-13175 Northwestern Univ., Evanston, Ill.
SURFACE ENHANCED RAMAN SPECTROSCOPY FOR INTERFACIAL CHARACTERIZATION Ph.D. Thesis
Steven George Schultz 1981 158 p
Avail: Univ. Microfilms Order No. 8125008

Surface enhanced Raman spectroscopy (SERS) is developed as a useful tool for the characterization of the interface between a solid metal (silver) electrode and the bulk (liquid) electrolyte. Some metal surfaces, especially silver, enhance the Raman scattering intensity by a factor of at least one million above normal Raman intensities. Exceptionally intense Raman signals are obtained from electrode surfaces if the adsorbate is also enhanced with resonance Raman (RR) processes. The total scattering cross section is increased by the product of the SERS and RRS enhancements. The power of this combination shows excellent quality Raman spectra from water soluble porphyrins adsorbed to the silver electrode even at porphyrin concentrations in the nanomolar range. The SERS intensity dependence with potential is sensitive to minor substituents on the porphyrin ring. Dissert. Abstr.

N82-13176 Northwestern Univ., Evanston, Ill.
RESONANCE RAMAN SPECTROSCOPIC INVESTIGATIONS OF THE ACTIVE SITE STRUCTURES OF HEMOGLOBIN AND

HEMERYTHRIN Ph.D. Thesis
Lori London Duff Weddell 1981 225 p
Avail: Univ. Microfilms Order No. 8125037

Resonance Raman spectroscopy is used to probe the active sites of hemoglobin and hemerythrin. For oxyhemoglobin oxygenated with O16O18, the resonance Raman spectrum in the FeO2 stretching region demonstrates end on O2 geometry, like the Pauling structure, and rules out the symmetric side on geometry of the Griffith structure. Several methemerythrins are studied including sulfido methemerythrin and semimetazido hemerythrin. Many methemerythrins have a Raman band at approximately 50 cm which is assigned to an iron oxygen stretch. The identity of the oxygen ligand and exchange behavior with H2O18 are studied. Oxygen isotope exchange with solvent water is observed only when oxyhemerythrin in H2O18 is converted to methemerythrin by addition of azide, cyanate or cyanide ions. Dissert. Abstr.

N82-13177 Seton Hall Univ., South Orange, N. J.
SURFACE CHARACTERIZATION OF DISPERSED SUPPORTED METAL CATALYSTS USING A 'TIME LAPSE' DYNAMIC PULSE TECHNIQUE Ph.D. Thesis
Robert William Warner 1981 127 p
Avail: Univ. Microfilms Order No. 8122399

A dynamic pulse vapor phase 'time lapse' procedure was used to investigate the initial turnovers occurring in the hydrogenation of a double bond over supported platinum and palladium catalysts. With the platinum catalysts, the product compositions obtained in olefin hydrogenation reactions were used to characterize the relative amounts of the various types of reactive sites present on the catalyst surface, leading to the development of a surface site model for these supported catalysts. Initial treatment of the palladium catalyst with an olefin resulted in a change in its reaction characteristics. Presaturation of either catalyst with hydrogen results in the storage of hydrogen. Surface site modifiers such as alcohols and benzene were used to study the competition between an olefin substrate and hydrogen for adsorption on each reactive site type. Dissert. Abstr.

N82-13178 Tennessee Univ., Knoxville.
THE CHEMISTRY OF SALINE WATER CHLORINATION Ph.D. Thesis
Werner Robert Haag 1981 161 p
Avail: Univ. Microfilms Order No. 8123155

Natural water chlorination chemistry is reviewed with particular reference to saline waters. Some experimental work led to the isolation of the first known pure solution of a N-bromo N chloroamine, namely, methyl bromochloramine. Physical and chemical properties of these compounds are characterized, in both concentrated CCl4 solution and dilute aqueous solution. Bromochloramines can readily form under conditions of power plant cooling water chlorination, if saline water is used. Chlorine losses at very high doses in seawater are simply the result of chlorate and bromate formation which is negligible at normal doses. The important chlorine produced oxidants, along with the relevant chemical reactions, are chosen as a basis for a kinetic model of saline water chlorination chemistry. Dissert. Abstr.

N82-13179 Duke Univ., Durham, N. C.
APPLICATION OF ELECTROCHEMISTRY TO BIOCHEMICAL PROBLEMS Ph.D. Thesis
Billy Gene Bennett 1981 91 p
Avail: Univ. Microfilms Order No. 8124789

An immunoassay technique using differential pulse anodic stripping voltammetry (DPASV) detection was demonstrated. The voltammetric immunoassay (VIA) technique is based on the competition of antigen with electrochemically labelled antigen for binding sites on a selective antibody. Estriol, used as a model system was labelled with the electroactive group, cadmium acetate. Addition of estriol antibody diminished the peak current due to binding of the electrochemically labelled estriol with the antibody. Subsequent addition of unlabelled estriol increased the peak current due to competitive displacement of the labelled estriol from the antibody. This competitive equilibrium was the basis of the technique that could be used as a sensitive immunoassay for estriol. Electrochemical labelling of a species can provide for quantitative measurements to be made on protein-ligand systems. Dissert. Abstr.

N82-13180 Georgia Univ., Athens.
DOUBLE BEAM-IN-TIME PHOTOACOUSTIC SPECTROSCOPY Ph.D. Thesis
Michael Franklin Cox 1981 149 p
Avail: Univ. Microfilms Order No. 8123045

A unique double beam-in-time photoacoustic spectrometer was constructed which utilizes a vibrating mirror to alternately illuminate sample and reference materials contained in a single cell. Fundamental studies of the photoacoustic signal generated by a single pulse of light were performed. The results demonstrate that the photoacoustic signal deviates from the predicted sawtooth waveform when the pulse duration exceeds approximately 15 milliseconds; primarily due to the response characteristics of the condensor microphone employed. The use of inductively-driven linear scanners in spectroscopic systems, including the double beam-in-time photoacoustic spectrometer, was examined. The presence of chemically-interfering caroxyl groups in a dextran gel, a chromatograhic packing material, was also investigated to demonstrate the utility of the photoacoustic spectrometer. Results indicate that carboxyl groups are likely present in the gel but cannot be effectively eliminated through chemical reduction. Dissert. Abstr.

N82-13181 Washington State Univ., Pullman.
DETERMINATION OF RADIONUCLIDE SPECIES BY ON-LINE RADIOCHROMATOGRAPHY USING HIGH RESOLUTION GAMMA RAY SPECTROSCOPY Ph.D Thesis
Asok Kumar Dasgupta 1981 192 p
Avail: Univ. Microfilms Order No. 8122412

A high resolution Ge(II) gamma-ray spectroscopy detector for the on-line multielement monitoring of liquid chromatography column effluents containing mixtures of gamma-emitting radionuclides is described. During the chromatogaphic experiments, sequential 0-2048 keV gamma-ray spectra were collected. This technique was successfully applied to the separation and determination of Ni-65(II),Mn-56(II), Co-60(II)Cu-64(II), and diethyldithiocarbamate, oxinated and acetylacetonate of Cr-51(III), CO-60(III),Cu-64(II) and, Mn-56(II) and diethyldithiocarbamate, oxinate, and acetylacetonate of Cu-64(II) by silica gel adsorption chromatography. Dissert. Abstr.

N82-13182 Tennessee Univ., Knoxville.
ELECTROCHEMICAL AND SPECTROSCOPIC STUDIES OF SOME LESS STABLE OXIDATION STATES OF SELECTED LANTHANIDE AND ACTINIDE ELEMENTS Ph.D. Thesis
David Edward Hobart 1981 168 p
Avail: Univ. Microfilms Order No. 8123158

Simultaneous observation of electrochemical and spectroscopic properties (spectroelectrochemistry) at optically transparent electrodes (OTE') is applied to the generation and characterization of some less stable oxidation states of selected lanthanide and actinide elements (Ce, Pr, Sm, Eu, Tb, Yb, U, Np, Am, and Cm) in complexing and noncomplexing aqueous solutions. Optically transparent electrodes used include reticulated vitreous carbon, metal screen OTE's and an OTE made from porous metal foam. Cyclic voltammetry at microelectrodes is used in conjunction with spectroelectrochemistry for the study of oxidation reduction couples. Dissert. Abstr.

N82-13183 Tennessee Univ., Knoxville.
SPECTROELECTROCHEMICAL INVESTIGATIONS IN MOLTEN SALT AND AQUEOUS MEDIA Ph.D. Thesis
Vincent Eugene Norvell 1981 203 p
Avail: Univ. Microfilms Order No. 8123171

The electroreduction of the manganese oxyanions in alkaline solutions and the electrooxidation of elemental sulfur and electroreduction of Nb(V) in molten AlCl3 NaCl mixtures was investigated in situ by means of spectroelectrochemical techniques and thin layer coulometry at optically transparent electrodes. The reduction of the manganese oxyanions in alkaline solutions was found to consist of simple reversible one electron transfers when carried out in solutions in which the reduction product is stable. One or more soluble intermediate species, probably containing Mn(IV) and possibly Mn(V) are formed when reduction is carried out in solutions where the product is unstable and undergoes disproportionation. The effect of varying the pH of

the solution of the overall reduction process is discussed. Spectral data on the reduction products are presented. Dissert. Abstr.

N82-13184 Wisconsin Univ. - Madison.
QUANTITATIVE INVESTIGATIONS OF MIXED OXIDATION STATES OF SOME FIRST ROW TRANSITION METALS IN INSULATOR MATRICES BY PHOTOELECTRON SPECTROSCOPY Ph.D. Thesis
Thomas Michael Rosseel 1981 221 p
Avail: Univ. Microfilms Order No. 8117531

A method using photoelectron spectroscopy quantitatively to determine the oxidation states of titanium, chromium, and manganese in insulator matrices is developed. Metal oxide mixtures which serve as model systems for other types of samples such as lunar basalts and transition metal catalysts were emphasized. It was determined that an extension of the Swartz and Hercules procedure involving standard curves of mixtures of different oxidation states in conjunction with a deconvolution technique. Could sucessfully determine the concentration of oxidation states differing in binding energy by not less than 1.5 eV using the 3P transition if the sensitivity of the measurement could be improved. On approach to improving the sensitivity was to construct and evaluate an electron energy analyzer with a high luminosity. A second approach was qualitatively to map the energy dependence of the 3p photoelectron cross section of determine the energy of maximum atomic sensitivity. In addition to the qualitative energy mapping, the relative 3p photoelectron cross sections, internally referenced to the O 2s cross section, were also determined from 100-150 eV. The relative error of the cross section measurements is estimated to be less than 15%. Dissert. Abstr.

N82-13185 Cincinnati Univ., Ohio.
METAL ION MODIFICATION OF POLYMERIC SULFUR NITRIDE, (SN) SUBX, ELECTRODES AND ELECTROCHEMICAL REDUCTION OF ACETYLENE AT A MOLYBDENUM MODIFIED (SN)SUB X ELECTRODE Ph.D. Thesis
Judith Faye Rubinson 1981 142 p
Avail: Univ. Microfilms Order No. 8123779

The surfaces of electrodes made from the polymeric conductor polymeric sulfur nitride (also known as polythiazyl or (SN) sub x is modified with the metal ions chromium, iron, and molybdenum. Using molybdenum modified (SN) sub x, the direct electrochemical conversion of acetylene to ethylene is accomplished, and the effects of variation of reaction conditions on the rate of conversion is investigated. Also a method for the assembly of film electrodes is developed, thereby enabling the electrode areas to be dramatically increased. The conversion of acetylene to ethylene in aqueous solution, with small amounts of ethane also being produced, is accomplished at (SN) sub x that has been dipped in a concentrated aqueous solution of sodium molybdate. A negative electrode potential of -1.3 V vs the standard calomel electrode is necessary for measurable rates of conversion, with more negative potentials increasing the rate. Dissert. Abstr.

N82-13186*# San Jose State Univ., Calif.
DEVELOPMENT AND TESTING OF DRY CHEMICALS IN ADVANCED EXTINGUISHING SYSTEMS FOR JET ENGINE NACELLE FIRES Final Report
Robert L. Altman, A. Campbell Ling, ed., Ludwig A. Mayer, and Donald J. Myronik Sep. 1979 314 p
(Grant NsG-2165)
(NASA-CR-165011) Avail: NTIS HC A14/MF A01 CSCL 21B

The effectiveness of dry chemical in extinguishing and delaying reignition of fires resulting from hydrocarbon fuel leaking onto heated surfaces such as can occur in jet engine nacelles is studied. The commercial fire extinguishant dry chemical tried are sodium and potassium bicarbonate, carbonate, chloride, carbamate (Monnex), metal halogen, and metal hydroxycarbonate compounds. Synthetic and preparative procedures for new materials developed, a new concept of fire control by dry chemical agents, descriptions of experiment assemblages to test dry chemical fire extinguishant efficiencies in controlling fuel fires initiated by hot surfaces, comparative testing data for more than 25 chemical systems in a 'static' assemblage with no air flow across the heated surface, and similar comparative data for more than ten compounds in a dynamic system with air flows up to 350 ft/sec are presented. S.L.

N82-13187# SRI International Corp., Menlo Park, Calif.
ENERGY LEVELS IN AND ON AN OXIDE FILM AS MEASURED BY ELECTROCHEMICAL METHODS Final Report, 14 Jul. 1978 - 14 Aug. 1981
S. R. Morrison Aug. 1981 7 p
(Contract DAAG29-78-C-0025; SRI Proj. 7592)
(AD-A103704; Rept-15521.6-C) Avail: NTIS HC A02/MF A01 CSCL 07/4

The oxide layer over silicon was studied using electrochemical methods (supplemented at times by MOS measurements). The most important conclusion was that alkali ion diffuse readily into SiO2 from solution. GRA

N82-13188# Virginia Univ., Charlottesville. Dept. of Physics.
TRAPPED ION RESEARCH
Daniel J. Larson 30 Apr. 1981 4 p
(Contract N00014-78-C-0772)
(AD-A098648) Avail: NTIS HC A02/MF A01 CSCL 20/3

Trapped negative ions are investigated using high resolution spectroscopy. Microwave transitions are observed in S(-) ions: The g sub j factor of ground state S(-) ions is measured. Laser and wavelength measurement improvements are implemented. This spectroscopy is applicable to improved frequency standards. GRA

N82-13189# Amherst Coll., Mass.
SOLUBILITIES OF DISSOLVED GASES IN SEA WATER Final Technical Report
Bruce B. Benson and Daniel Krause, Jr. 18 Nov. 1980 15 p refs
(Contract N00014-78-C-0198)
(AD-A100675) Avail: NTIS HC A02/MF A01 CSCL 08/10

The concentration of an atmospheric gas in water in equilibrium with air was measured making corrections for molecular interactions in the vapor phase. The results for oxygen show that the UNESCO tables for the solubility of oxygen give values in freshwater that are low by from 0.15% to 0.35% depending upon temperature. The solubility of hydrogen was determination in pure water and is sea water. Results give very accurate values of oceanograhic and limnological work and are expeciia especially significant becuase of the information provided about the properties of liquid water. The dependence of solubility on salinity and the functional dependence of the salting-out coefficient upon temperature are discussed. J.M.S.

N82-13190# Sandia Labs., Albuquerque, N. Mex.
PROPERTIES OF MATTER AT ULTRA-HIGH PRESSURES
F. C. Perry, M. A. Sweeney, and J. R. Asay 1981 4 p refs Presented at the 8th AIRAPT Conf. and the 19th EHPRG Conf., Uppsala, 17 Aug. 1981
(Contract DE-AC04-76DP-00789)
(DE81-026504; SAND-81-0365C; CONF-810827-2) Avail: NTIS HC A02/MF A01

Some recent experiments using the precision impact technique to study the shock-induced vaporization of lead (Pb) are described. Previous experiments utilized strong shock waves to investigate the equation of state of lead and other metals. Emphasis is on the possibility of direct observation of rate or kinetic effects in such phase transitions, and it is believed that the highly resolved diagnostics are capable of revealing these effects. DOE

N82-13191# Ames Lab., Iowa.
POWER-PLANT FLY-ASH UTILIZATION: A CHEMICAL-PROCESSING PERSPECTIVE
G. Burnet and M. J. Murtha 1981 12 p refs Presented at the Portland Cement Assoc. Conf. on Manufacturing Process, Albuquerque, N. Mex., 14-15 Jan. 1981 Prepared jointly with Iowa State Univ. of Science and Technology
(Contract W-7504-eng-82)
(DE81-025452; IS-M-321; CONF-810151-1) Avail: NTIS HC A02/MF A01

Solid wastes from coal combustion, including fly ash, are classified as hazardous under present EPA definitions. Research on fly ash utilization including extraction of metals and uses for process residues is discussed. One process investigated uses a

lime-soda sinter method to form soluble aluminate compounds from mixtures of fly ash, limestone, and soda ash. The aluminates are extracted, treated to remove silicates, and precipitated: the precipitate is calcined to metallurgical grade alumina. The extract residue shows promise as a raw material for the production of Portland cement. Process economics, effects of alumina and silica contents of the fly ash, sintering temperatures and time, and sales credits for by-products are discussed. DOE

N82-13192# AeroChem Research Labs., Inc., Princeton, N. J.
RATE COEFFICIENTS OF COMBUSTION/FUEL CONVERSION REACTIONS BY HIGH-TEMPERATURE PHOTOCHEMISTRY Progress Report, 1 Sep. 1980 - 30 Jun. 1981
William Felder Jul. 1981 7 p refs
(Contract DE-AC02-77ER-04169)
(DE81-027965; DOE/ER-04169/T1; AeroChem-TN-219; COO-4169-6) Avail: NTIS HC A02/MF A01

Reliable kinetic data on isolated elemetary combustion reactions spanning a broad temperature range are required for modeling and scaling studies and reducing the pollutant formation from fossil-fuel burning devices. A new technique, High Temperature Photochemistry (HTP) combines the technology of the High-Temperature Fast-Flow Reactors developed to study kinetics of metal atom/oxide reactions with the flash photolysis technique. Aspect of a partially complete HTP study on chemical reactions CH3 oxidation by O2 and O atoms are presented. DOE

N82-13193# Department of Energy, Morgantown, W. Va.
HIGH-TEMPERATURE MEASUREMENTS OF ALKALI LEVELS IN AN EXPERIMENTAL 6-INCH AFBC
R. J. Anderson, U. Grimm, and R. R. Romanosky Feb. 1981 15 p refs
(DE81-023632: DOE/METC/RI-188) Avail: NTIS HC A02/MF A01

Alkali metals (K and Na) were measured with an on-line atomic emission (AE) spectrometer in the effluent stream of an atmospheric fluidized-bed combustor (AFBC). To simulate performance of a pressurized fluidized-bed combustor dolomite was used for the bed material and Pittswick coal was burned. The on-line AE unit monitored a representative fraction of the effluent stream. The sample stream was provided by a specially designed system fabricated of Hastalloy X. To control particle size the sample system contained a cyclone having a cut-off diameter of 1 micron. Flow was regulated by controlling the pressure of the freeboard from 0 to 20 inches of water. In all tests a ratio of K to Na of about 3 to 1 was observed. This ratio was verified by analysis of aerosol samples. Concentrations of alkali were about an order of magnitude higher than those measured by the AE unit. Alkali levels (K and Na) on the order of 10 ppM were measured on the sample stream. DOE

N82-13194# Oak Ridge National Lab., Tenn. Atomic, Molecular, and High Voltage Physics Group.
STUDIES OF PHOTOIONIZATION IN LIQUIDS USING A LASER TWO-PHOTON IONIZATION CONDUCTIVITY TECHNIQUE
K. Siomos (Tennessee Univ., Knoxville) and L. G. Christophorou (Tennessee Univ., Knoxville) 1981 5 p refs Presented at the 7th Intern. Conf. on Conduction and Breakdown in Dielectric Liquids, Berlin, 27 Jul. 1981
(Contract W-7405-eng-26)
(DE81-026514: CONF-810734-2) Avail: NTIS HC A02/MF A01

One-photon ionization studies of solute molecules in a liquid medium are limited by the absorption of the medium. A laser two-photon ionization technique using a frequency tunable dye laser was developed, whereby the photoionization threshold of a solute molecular was determined from the induced conductivity in a liquid-medium due to electron-ion pair formation solute. The two-photon induced electron-ion current is measured as a function of the laser wavelength. The photoionization of N,N,N,N-tetramethyl-p-phenylendiamine pyrene and fluoranthene in liquid n-pentane are discussed. DOE

N82-13195# Rockwell International Corp., Golden, Colo.
DYNAMIC MASS SPECTROMETRY: A RESIDUAL GAS ANALYSIS METHOD AND SOME APPLICATIONS
Tom L. McFeeters 1981 18 p Presented at Vacuum Brazing Conf., Santa Barbara, Calif., 2-4 Jun. 1981
(Contract DE-AC04-76DP-03533)
(DE81-026230; RFP-3228; CONF-8106106-1) Avail: NTIS HC A02/MF A01

Dynamic mass spectrometry is a unique method of residual gas analysis used to monitor and trouble-shoot industrial vacuum process operations. Applications and results of the method, and descriptions and analytical method developed are presented. DOE

N82-13196# Occidental Research Corp., Irvine, Calif.
CONTROLLED-FLASH PYROLYSIS Quarterly Technical Progress Report, Apr. - Jun. 1981
K. Durai-Swamy, S. C. Che, C. B. Chen, R. Jain, S. S. Kim, and H. VonSchonfeldt Aug. 1981 55 p refs
(Contract DE-AC22-80PC-30264)
(DE82-000284; DOE/PC-30264/09; QTPR-3) Avail: NTIS HC A04/MF A01

Thirteen runs were made in the controlled flash pyrolysis unit with a coal feed rate of about 2 kg/hour. Preliminary material balance for these tests is presented. The laboratory scale (1 gm/min.) pyrolysis reactor was used to evaluate several model compounds as quench solvents. Free radical pyrolysis studies, using an electron spin resonance spectrometer, show that vapor phase radicals from coal pyrolysis resemble phenalenyl radical and that char placed on top of the pyrolyzing coal absorbs these vapor phase radicals effectively. DOE

N82-13197# Naval Weapons Center, China Lake, Calif.
PREPARATION AND CHARACTERIZATION OF HYDROGENATED AMORPHOUS SILICON Final Technical Report, 1 Jun. 1980 - 31 May 1981
T. M. Donovan 21 Aug. 1981 22 p refs Prepared for Midwest Research Inst., Golden, Colo.
(Contract DE-AC02-77CH-00178)
(DE81-030973: SERI/TR-8142-4-T3) Avail: NTIS HC A02/MF A01

The deposition and characterization of dc magnetron sputtered amorphous silicon hydride and an evaluation of its potential as a solar material is summarized. Infrared vibrational spectra of films deposited in the 200 to 3000C temperature range show that hydrogen incorporated mainly as SiH. Doping with nitrogen or phosphorus is ineffective in increasing conductivity or photoconductivity. During deposition, dc bias of the substrate is successful in reducing interface contamination and improving the coalescence of the condensing Si. High levels of defects or dangling bonds are inferred from both optical and transport measurements made on bias deposited, single mode, structurally homogeneous SiH films. DOE

N82-13198# West Virginia Univ., Morgantown. Dept. of Chemical Engineering.
REDUCTION OF NITRIC OXIDE IN A FLUIDIZED BED Final Report
Z. Huang, G. T. Chen, and C. Yl. Wen Jul. 1981 69 p refs
(Contract DE-AT21-79MC-11284)
(DE81-030488: DOE/MC-11284/1100) Avail: NTIS HC A04/MF A01

Reduction of nitric oxide (NO) by two kinds of char, coke, carbon monoxide and methane was investigated in a bed of glass sand fluidized by nitrogen containing a small amount of nitric oxide. The bed was heated externally by an electric heater and the effect of char loading on NO reduction was studied over a wide range of temperatures. Reactivities of different chars and coke depend upon such physical properties as surface area, porosity, type of char, and carbon content. The reduction of NO with carbon monoxide was also investigated. Results showed that the stainless steel wall exerted a significant catalytic effect on this reaction. To obtain information for design and operation of fluidized-bed combustors, kinetic evaluation of the reaction of NO with Char 1 was performed. Data based on the two-phase bubble model were analyzed to formulated the reaction rate expression, activation energy, and the frequency factor. DOE

N82-13199# Bureau of Mines, Avondale, Md.
WEAR PROPERTIES OF ELECTRODEPOSITED TITANIUM DIBORIDE COATINGS
David R. Flinn, James A. Kirk, Michael J. Lynch, and Bruce G.

VanStratum Jun. 1981 37 p refs
(PB81-233314; BM-RI-8537) Avail: NTIS HC A03/MF A01 CSCL 11C

A chemical conditioning technique, which greatly simplifies the preparation of plating baths for the electrodeposition of titanium diboride (TiB2) coatings, is described. The plating technique was used to prepare samples of titanium diboride (TiB2) coatings on three types of substrate materials. These samples were then evaluated in both low and high speed wear-test programs to determine the wear resistance, microhardness, and adhesion of the coatings. GRA

N82-13200 Stanford Univ., Calif.
A MINIATURE, THIN-FILM THERMAL CONDUCTIVITY DETECTOR FOR AN INTEGRATED GAS CHROMATOGRAPH Ph.D. Thesis
John Hallock Jerman 1981 135 p
Avail: Univ. Microfilms Order No. 8124086

A miniature thermal conductivity detector developed for use in an integrated gas chromatography system is described. The miniature detector is fabricated using integrated circuit processing techniques, and consists of a thin film nickel resistor supported on a Pyrex glass membrane. The Pyrex membrane is supported on its periphery by a silicon substrate chip, which is clamped over an etched detector channel to form the detection volume. The detector volume is more than 5 orders of magnitude smaller than conventional GC thermal conductivity detectors. Nickel is used as the sensing element in the detectors. The detector is preferably operated in a constant temperature configuration in order to reduce the temperature effects of gases and the detector support and to protect the detector from thermal runaway. In the miniature GC system, the detector is capable of detecting gases at less than 1 ppm concentration, in 20 nl samples.
Dissert. Abstr.

N82-13201 Northwestern Univ., Evanston, Ill.
A STUDY OF THE FORMATION AND STRUCTURE OF SMALL CLUSTERS OF NOBLE GASES AND SULFUR HEXAFLUORIDE FORMED IN LAVAL NOZZLE MOLECULAR BEAMS Ph.D. Thesis
Sang Soo Kim 1981 242 p
Avail: Univ. Microfilms Order No. 8124925

Extremely small clusters of the rare gases Ar, Kr, and Xe are studied using electron diffraction. Each gas is expanded in a He carrier gas through a small Laval nozzle. The nozzle is the first stage of a molecular beam. As the gas expands the condensable vapor highly supersaturates and clusters are formed. The structure and properties of very small clusters are significantly different from those of the bulk phase. All cluster formed from mixtures with 6% Kr and 6% Xe in the He carrier gas are icosahedron, with the range of sizes 100 to approximately 300 atoms per cluster. Also, all of the experiments using 6%, to 12.5%, and part of 25% Ar, with He carrier, produce clusters which are icosahedral structures. However, strong patterns at 25% Ar in He (i.e., larger cluster sizes), and 100% Ar expansions produce mixed patterns of the two structures. The cluster temperature range from 20 to 60 K and the cluster beam contains 20 to approximately 50% free atoms. Dissert. Abstr.

N82-13202 Delaware Univ., Newark.
SALT REMOVAL FROM BRACKISH WATER BY CONTINUOUS PROCESSES WITH AMPHOTERIC, THERMALLY REGENERABLE ION-EXCHANGE RESINS Ph.D. Thesis
Tah-Ben Hsu 1981 363 p
Avail: Univ. Microfilms Order No. 8123816

Two amphoteric, thermally regenerable ion exchange resins, Amberlite XD 2 and Amberlite XD 5, are utilized to remove salt from brackish water by continouous processes. The physical and chemical properties of both resins are studied, including their resin capacity, density, porosity and swelling phenomena. The kinetic reaction of mass transfer in these resins is studied by means of frequency analysis during forced temperature cycling and also by fixed bed breakthrough experiments. Amberlite XD 2 has a higher mass transfer rate than Amberlite XD 5. A truly countercurrent, continuous adsorption process to remove salt from water is evaluated using theoretical simulation and experimental results. Amberlite XD 2 shows better separation performance than Amberlite XD 5 under the same operation conditions. The linear equilibrium line case, which may be important for dilute concentrations, also is simulated theoretically. Dissert. Abstr.

N82-13203 Stanford Univ., Calif.
TWO STUDIES OF FLUIDIZED BEDS: HEAT TRANSFER AND GRID JETS Ph.D. Thesis
Walter Thompson Ropchan 1981 162 p
Avail: Univ. Microfilms Order No. 8124144

A videotape system as used to record the rise of an injected hot bubble into an incipiently-fluidized bed at ambient conditions. Both the initial temperature and that at a given height were measured for several bubbles. When extrapolated, the data indicate that over 99 percent of the excess heat above ambient is lost within one bubble diameter away from the point of injection. In addition to visual observation, cine-photography was used to record high-speed phenomena around a jet. Three regimes of jet behavior were observed: periodic, meandering, and unstable. A rather elongated bubble in the shape of a jet first pinches off just barely above the orifice. The pinching frequency was found to be determined solely by the gas flowrate. These pinched structures, in turn, break up into bubbles, sometimes coalescing into doublets, triplets, etc. As coalescence phenomena dominate the resulting bubble frequency, a lack of an apparent preference for the type of bubble formed was found. Dissert. Abstr.

N82-13204 Georgia Inst. of Tech., Atlanta.
PREPARATION, CHARACTERIZATION AND PERFORMANCE OF NON-UNIFORM METAL CATALYSTS Ph.D. Thesis
Yen-Shin Shyr 1980 485 p
Avail: Univ. Microfilms Order No. 8124643

Nonuniformly distributed supported Pt catalyst is prepared by adding NaBr, and/or Ca to chloraplatinic acid impregnating solution. The effect of chemical competitors in the adsorption of the impregnation process was studied. Coingredients included the following acids and salts HCl, HF, HNO3, acetic acid, citric acid, tartaric acid AlCl3, NaCl, NaF, NaBr, NaNO3, NaPO4, Na benzoate, and Na Citrate. Radial Pt profiles were analyzed by electron probe microanalysis. Five catalysts--two with monotonically increasing profiles from bead center to surface, two with monotincally decreasing profiles and one with a uniform profile on the gamma alumina support, and two catalyst-- one with an increasing profile and one with a uniform profile on silica alumina support, were prepared and characterized by electron probe microanalysis and hydrogen chemisorption. The Pt contents ranged from 0.5% to 1.1% as measured by a spectrophotometric method. The Pt particle sizes were determined by H2 chemisorption. Dissert. Abstr.

N82-13205 Missouri Univ. -Rolla.
SOLUBILITIES IN MULTICOMPONENT SYSTEMS OF NONSPECIFIC INTERACTIONS Ph.D. Thesis
William Eugene Acree, Jr. 1981 155 p
Avail: Univ. Microfilms Order No. 8123580

Solubilities are reported for (1) iodine at 25 C in binary mixtures of carbon tetrachloride with cyclohexane, n-hexane, n-heptane, and octamethycyclotetrasiloxane (OMCTS), mixtures of cyclohexane with n-hexane and with OMCTS, and mixtures of n-hexadecane with n-heptane and with isooctane; (2) benzil in binary mixtures of carbon tetrachloride with cyclohexane, n-hexane, and n-heptane, mixtures of n-hexane cyclohexane and with n-heptane; (3) benzene with cyclohexane and with toluene; (4) stannic iodide in mixtures of carbon tetrachloride and cyclohexane, and (5) benzoic acid in binary mixtures of carbon tetrachloride with cyclohexane n-hexane, and n-heptane, binary mixtures of cyclohexane n-hexane and n-heptane; and for ternary mixtures of carbon tetrachloride + cyclohexane n n-hexane, + n heptane. Solubilites are also reported for benzoic acid in several binary solvent mixtures at 30 C and for m-toluic acid at 25 C in binary mixtures of cyclohexane and n-hexane.
Dissert. Abstr.

N82-13206 Missouri Univ. -Rolla.
MOLECULAR INTERACTIONS IN AMPHIPHILIC ASSOCIATION STRUCTURES Ph.D. Thesis
Beverly Bendiksen 1981 115 p
Avail: Univ. Microfilms Order No. 8123586

The interactions of water, a surfactant, and cosurfactant in microemulsion systems were studied by experimental and theoretical means. Intermolecular bond strengths in pre-micellar aggregates of surfactant, cosurfactant, and water were calculated using semiempirical molecular orbital theory by the method of the CNDO/2 program. The stability of pre-micellar aggregates in a nonpolar continuous medium was estimated using a thermocycle, and the onset of inverse micelle formation was predicted. The four component phase diagram of water - octanoic acid - sodium octanoate - carbon tetrachloride was explored and the phase behavior of the inverse micellar region explained using infrared spectrophotometry and molecular weight determinations. Dissert. Abstr.

N82-13207 Polytechnic Inst. of New York, Brooklyn.
POTENTIAL USE OF THE MINICOMPUTER CONTROLLED POWDER DIFFRACTOMETER FOR THE STRUCTURE DETERMINATION OF SMALL QUANTITIES OF RATHER IMPURE MATERIALS Ph.D. Thesis
Ronald Jenkins 1981 157 p
Avail: Univ. Microfilms Order No. 8118879

Minicomputer controlled diffractometer for routine powder diffractometry is investigated. Mixed tetra-fluorides of Europium, Magnesium and Strontium are used. Structures are determined on 50 mg. aliquots of EuMgF4, SmMgF4 and SrMgFd4 with sample purity generally in the 80 percent to 90 percent region. Cell parameters are determined to about 6 parts in 10,000. All three materials are found to be isostructural, each being orthorhombic with four formula units per unit cell. Dissert. Abstr.

N82-13208 Rensselaer Polytechnic Inst., Troy, N. Y.
SPECTROELECTROCHEMISTRY, FLASH PHOTOLYSIS AND PHOTOGALVANIC EFFECT OF METHYLENE BLUE AND SAFRANIN-O Ph.D. Thesis
Charles Edward Baumgartner 1981 275 p
Avail: Univ. Microfilms Order No. 8121137

Organic dyes are often employed in chemical, photochemical, or electrochemical redox reactions which require a visible color change between reactant and product. Two such dyes, methylene blue (3,7-dimethyl-amino-phenothiazine chloride) and safranin-O (2,8-dimethyl-3,7-diamine-phenazinium chloride) were investigated; their photochemistry being characterized by xenon flash photolysis and electrochemistry being monitored by various spectroelectrochemical techniques. In addition, the photogalvanic effect in the safranin-O/ethylenediaminetetraacetic acid photosystem was characterized with respect to participant concentrations. Spectroelectrochemical techniques of attenuated total reflectance spectroscopy, optically transparent thin layer electrochemical spectroscopy, and multiple specular reflection spectroscopy were employed to optically monitor dye reduction and leucodye oxidation. Xenon flash photolysis was employed to dye triplet states and semireduced free radicals resulting from photoreduction with various reducing agents. Dissert. Abstr.

N82-13209 Georgia Inst. of Tech., Atlanta.
STUDIES OF SAMPLE INTRODUCTION FOR INDUCTIVELY COUPLED PLASMA EMISSION SPECTROMETRY Ph.D. Thesis
Andrew William Boorn 1981 224 p
Avail: Univ. Microfilms Order No. 8124281

Pneumatic nebulization of a liquid sample, to produce an aerosol which is injected into the plasma is the most commonly employed method of sample introduction for the ICP, and was investigated in detail. It is found that the pneumatic nebulization process is approximately 1% efficient, and that the mechanism of aerosol transport to the plasma is not well characterized. If the efficiency of nebulization, an hence detection limit, is to be improved, the aerosol transport mechanism must be known. This mechanism was studied by use of Andersen cascade impactor to collect the aerosols produced by pneumatic nebuilzers. It was found that while the nebulizers produce droplets having a median diameter in the rate 50-150 micrometer, the median droplet size reaching the plasma is 2-4 micrometers. The major process influencing droplet transport efficiency are found to be gravitational setting an impaction, which reduce transport efficiency, and evaporation, which increases the amount of sample reaching the plasma. Dissert. Abstr.

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N82-13210 Ohio State Univ., Columbus.
FATIGUE CRACK INITIATION AND ELECTROCHEMICAL BEHAVIOR OF 403 STAINLESS STEEL IN AQUEOUS ENVIRONMENTS Ph.D. Thesis
Hamdy Mohamed Mourad Shalaby 1981 315 p
Avail: Univ. Microfilms Order No. 8121854

The fatigue crack initiation characteristics and the electrochemical behavior of quenched and tempered Type 403 stainless steel is studied in several environments. The tests are conducted in air, in deaerated distilled water, and in deaerated aqueous solutions of chloride, sulphate, phosphate, hydroxide, and silicate anions across a range of pH levels. Slight pitting occurs on the electrode surface after measurement of anodic polarization curves in 0.01M sulphate solutions, while crevice attack occurs in 1.0M solutions of pH's 7 and 10 at 100 C. The pitting corrosion in neutral and alkaline solutions of sodium sulphate has the same character as pitting of steel in sodium chloride solutions. Crevices are preferred sites for pitting, which later transform into severe crevice corrosion. Surface preparation factors have a profound effect on the nucleation of localized attack on 403 stainless steel in sodium sulphate solutions at 100 C. Dissert. Abstr.

N82-13211 Stanford Univ., Calif.
ACOUSTIC NONDESTRUCTIVE EVALUATION OF MICROSTRUCTURE Ph.D. Thesis
Nasser Bozorg-Grayeli 1981 221 p
Avail: Univ. Microfilms Order No. 8124042

Acoustic velocity and attenuation was measured in pure copper specimens with different grain sizes. The attenuation was found to be a mixture of stochastic and Rayleigh grain scattering. The measured acoustic attenuation was in good agreement with quantitative predictions based on the scattering theories of Lifshits and Parkhomovski. These experiments demonstrated the feasibility of grain size assessment by nondestructive acoustic attenuation measurement. Velocity and attenuation measurements were made on plain carbon and low alloy steels heat treated to have pearlite/ferrite, bainite, and martensite microstructures. For any given steel composition, velocity was lowest in martensite, initermediate in bainite, and highest in pearlite/ferrite. In a 76mm round bar of 304 stainless steel, variations in acoustic velocity and attenuation depended upon grain size and texture as predicted by acoustic theory. The acoustoelastic constant varied with radial position apparently because of the texture gradient. Dissert. Abstr.

N82-13212 Northwestern Univ., Evanston, Ill.
CYCLIC DEFORMATION AND FATIGUE CRACK INITIATION OF A COHERENTLY PRECIPITATING Ni-14.4 AT % Al ALLOY Ph.D. Thesis
Donald Louis Anton 1981 222 p
Avail: Univ. Microfilms Order No. 8124843

An inverse exponential equation was found to model the transient cyclic hardening behavior of all specimens tested. An empirical constant, R, was observed to change significantly with precipitate size, having a maximum value for the peak aged specimen and decreasing substantially as both under and over aging became more severe. Further analysis of this equation showed that the cyclic hardening rate was proportional to the term R. Microstructural examination illustrated that more uniform plastic deformation occurred during early cyclic straining of the peak aged material than in either the under or over aged cases. Furthermore, initial paired dislocation motion was replaced by unpaired tangles and a mottling of the dark field images of the precipitates. A mechanism, conforming with the microstructural evidence, is proposed to explain the substantial cyclic hardening based on the accumulated back and forth motion of dislocations through the precipitates. Dissert. Abstr.

N82-13213 Northwestern Univ., Evanston, Ill.
FATIGUE CRACK PROPAGATION STUDIES IN TWO CRYOGENIC STEELS Ph.D. Thesis
Hyong Jun Choi 1981 176 p

Avail: Univ. Microfilms Order No. 8124867

Fatigue crack growth rates were studied at low and intermediate stress intensity levels for two intercritically tempered cryogenic steels, Fe-9Ni-0.1C and Fe-4Mn-0.15C. Propagation rates were determined for varying intercritical tempering time corresponding to varying amounts of retained austenite, untempered martensite and varying degree of ferrite matrix recovery. In stage 2, the law da/dN = C (delta K)(m) was observed for all cases with coefficient m aprox. = 3.5. It was found that the heat treatments that optimize impact fracture properties in these steels are also beneficial with respect to da/dN in stage 1, while no beneficial effect at all was observed for stage 2. Moessbauer spectroscopy results indicate that the retained austenite in the rack path is transformed to martensite as was earlier shown for Charpy specimens. Auger composition analysis indicate a tendency for a stage 1 crack tip to avoid the mechanically induced brittle untempered martensite while no such preference was observed for stage 2 or when the microstructure had a less distinct separation of hard and soft phases. Dissert. Abstr.

N82-13214 Cincinnati Univ., Ohio.

AN INVESTIGATION OF NOTCH LOW CYCLE FATIGUE LIFE BEHAVIOR OF RENE' 80 AT HIGH TEMPERATURE Ph.D. Thesis

Paul Allen Domas 1981 243 p

Avail: Univ. Microfilms Order No. 8123748

The cyclic stress-strain behavior of circumferentially notched bars was an elastic-plastic finite element computer model analyzed using to investigate cyclic material response at the notch roof. Low cycle fatigue tests on smooth and notched bars of the cast nickel-base superalloy, Rene'80 in the temperature range of 760 C to 982 C (1400 F to 1800 F) were conducted to provide test data for comparison to analytic predictions and the failed specimens were studied by optical, scanning, and transmission electron microscopy. A predictive technique incorporating the parameter of strain energy density integrated over a dissipative volume at the notch root was developed. Correlation of predicted results for circumferentially notched cylindrical bars and experimental data was found. The influence of material behavior as manifest in damage/deformation mechanisms was particularly evident in that an oxidation process was identified as the principal cause of failure at 982 C (1800 F). Dissert. Abstr.

N82-13215 Cincinnati Univ., Ohio.

SUBSTRUCTURE OF 316 STAINLESS STEEL PIPE WELDMENTS Ph.D. Thesis

Jude Reynold Foulds 1981 264 p

Avail: Univ. Microfilms Order No. 8123752

Weldment sections from 'formed and welded' large diameter 316 stainless steel pipe for structural use in the hot-leg of the liquid metal fast breeder reactor (LMFBR) were characterized microstructurally primarily through TEM. The weld metal dendritic substructure appears as a dislocation substructure with low-angle boundaries (< misorientation) demonstrated to be stable on reannealing and built up on interdendritic planes of mismatch. The weld and parent metal exhibit distinctly different elevated temperature recovery characteristics proposed to be chiefly responsible for the generally observed weld/parent metal differences in elevated temperature time-independent and-dependent mechanical behavior. The GTA weld shows a low ferrite content (-2%) with globular morphology uncharged on reannealing. The SA weld shoes no ferrite (susceptible to hot-cracking), an undesirable large columnar grain size, a distinct weld centerine at least on the inside bead, and the extensive occurrence of slag inclusion. Dissert. Abstr.

N82-13216*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

AN IMPROVED STRESS CORROSION TEST MEDIUM FOR ALUMINUM ALLOYS

T. S. Humphries and J. E. Coston Nov. 1981 11 p refs

(NASA-TM-82452) Avail: NTIS HC A02/MF A01 CSCL 11F

A laboratory test method that is only mildly corrosive to aluminum and discriminating for use in classifying the stress corrosion cracking resistance of aluminum alloys is presented along with the method used in evaluating the media selected for testing. The proposed medium is easier to prepare and less expensive than substitute ocean water. Author

N82-13217*# Pittsburg Univ., Pa. Dept. of Metallurgical and Materials Engineering.

INVESTIGATION INTO THE ROLE OF NaCl DEPOSITED ON OXIDE AND METAL SUBSTRATES IN THE INITIATION OF HOT CORROSION Semiannual Report, 1 Apr. - 1 Oct. 1981

N. Birks 1 Oct. 1981 24 p

(Grant NAG3-44)

(NASA-CR-165029; SAR-3) Avail: NTIS HC A02/MF A01 CSCL 11F

Morphological aspects of the conversion to Na2SO4 of NaCl deposits over the temperature range 500-700 C, in air with added SO2 and H2O. Progress of the reaction was observed by withdrawing samples at various times and examining them under the scanning electron microscope using EDAX to assess the extent of chloride to sulfate conversion. These initial results show that the conversion to Na2SO4 proceeds directly on the sodium chloride surface as well as on the surrounding substrate due to evaporation of NaCl from the solid particle. The mechanism of this reaction could involve reaction in the vapor to produce Na2SO4 which then deposits, alternatively Na2SO4 could form directly on the substrate surface due to direct reaction there between the vapors NaCl, SO2 and O2. A.R.H.

N82-13218*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

A QUANTITATIVE STUDY OF FACTORS INFLUENCING LAMELLAR EUTECTIC MORPHOLOGY DURING SOLIDIFICATION

W. F. S. Kaukler Nov. 1981 263 p refs

(NASA-TM-82451) Avail: NTIS HC A12/MF A01 CSCL 11F

The factors that influence the shape of the solid-liquid interface of a lamellar binary eutectic alloy are evaluated. Alloys of carbon tetrabromide and hexachloroethane which serve as a transparent analogue of lamellar metallic eutectics are used. The observed interface shapes are analyzed by computer-aided methods. The solid-liquid interfacial free energies of each of the individual phases comprising the eutectic system are measured as a function of composition using a 'grain boundary groove' technique. The solid-liquid interfacial free energy of the two phases are evaluated directly from the eutectic interface. The phase diagram for the system, the heat of fusion as a function of composition, and the density as a function of composition are measured. The shape of the eutectic interface is controlled mainly by the solid-liquid and solid-solid interfacial free energy relationships at the interface and by the temperature gradient present, rather than by interlamellar diffusion in the liquid at the interface, over the range of growth rates studied. S.L.

N82-13219# Rockwell International Science Center, Thousand Oaks, Calif.

LASER HEAT TREATMENT OF TRACK COMPONENTS IN COMBAT VEHICLES, PHASE 1 Final Report, 26 Sep. 1979 - 25 Sep. 1980

D. S. Gnanamuthu and R. J. Moores Jun. 1981 98 p

(Contract DAAK30-79-C-0136)

(AD-A102761; SC5248.12FR) Avail: NTIS HC A05/MF A01 CSCL 11/6

Abrasive wear locations in end connectors and center guides used in combat vehicles were precision heat treated with a continuous wave CO2 laser beam. Self quenched casings 3 to 4 mm deep, with predominantly martensitic microstructure of hardness between Rc 50 to 54, were observed. Coverage rates up to 90 mm/s were obtained. Abrasive wear tests revealed that laser heat treated specimens had smaller wear scar dimensions than untreated specimens. In a 9 mm thick AISI 4140 steel plate, case depth of 6.5 mm was obtained. Heat treatment was conducted with laser beam power of 4000 to 5000 W, with the beam shaped by a three-mirror optical tooling to provide a uniformly intense beam of size 19 x 19 mm. with this optical tooling, a stand-off distance of 445 mm between beam directing mirror and work surface was available. Laser heat treating cost estimates for an end connector were found to be $0.60 and for a center guide $0.69. Specifications and

cost estimates for a prototype laser heat treating facility were developed. Author

N82-13220# Acurex Corp., Mountain View, Calif. Aerotherm Div.
TITANIUM RESPONSE TO A NUCLEAR RADIATION ENVIRONMENT Final Report, 1 Nov. 1979 - 31 Oct. 1980
K. Triebes and G. Liu 20 Jan. 1981 42 p refs
(Contract DNA001-79-C-0158)
(AD-A102516; DNA-5596F; FR-81-10/AS) Avail: NTIS HC A03/MF A01 CSCL 11/6

Titanium response under a nuclear encounter environment was modeled and incorporated into a computer program. Predictions were compared with experimental results under simulated laboratory environments. Excellent agreement were obtained for all test cases. While no evidence of sustained combustion was observed for the missile shroud under potential flight environments, it was demonstrated that titanium failed catastrophically under certain simulated conditions. Author

N82-13221# Rockwell International Science Center, Thousand Oaks, Calif. Science Center.
MECHANISMS BY WHICH HUMIDITY ALTERS DUCTILITY Annual Technical Report, 15 Apr. 1980 - 14 Apr. 1981
W. L. Morris, M. R. James, and R. V. Inman Sep. 1981 56 p refs
(Contract N00014-79-C-0034)
(AD-A105530; SC5211.2AR) Avail: NTIS HC A04/MF A01 CSCL 11/6

The ductility of surface of Al 2219-T851 has been measured in two regimes of plastic strain. In the small strain regime, we determined the microplastic strain which develops within individual grains, at the surface, during fatigue at cyclic stress amplitudes substantially below the bulk yield strength. Initially the deformation is elastic; but, with increasing fatigue, local plastic strains under tensile load develop within individual grains and can approach 0.5%. It is these plastic strains which lead to crack initiation at the surface. The measurement technique is described, and data are presented for two different heats of 2219 taken in dry and in humid air. These materials are thought to differ substantially in as-received hydrogen content. It appears from our results that internal hydrogen increases the rate of development of microplasticity at the surface during fatigue, accelerating crack initiation. The role of surface oxide in determining surface ductility is complex, and is apparently a function of the internal hydrogen content of the alloy. In the large strain regime, the ductility of the surface is assessed by measuring the opening displacements of the tips (CTOD) of small surface cracks. GRA

N82-13222# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
EFFECT OF LOW-TEMPERATURE IRRADIATION WITH (n, ALPHA) HELIUM PRODUCTION ON TENSILE PROPERTIES OF 12 Cr-1 Mo VW-TYPE STEELS
R. L. Klueh, J. M. Vitek, and M. L. Grossbeck 1981 5 p refs Presented at the Fusion Reactor Mater. Meeting, Seattle, 9 Aug. 1981
(Contract W-7405-eng-26)
(DE81-028578; CONF-810831-10) Avail: NTIS HC A02/MF A01

Tensile specimens for small heats of ferritic (martensitic) steel irradiated in the High Flux Isotope Reactor (HFIR) to displacement damage levels. Transmutation of Ni by thermal neutrons during irradiation in HFIR leads to helium production rates similar to those anticipated in a fusion reactor. Displacement damage is produced simultaneously by fast neutron flux in the reactor. After irradiation, specimens were tested at room temperature and 3000 C. Yield strength and ultimate tensile strength of irradiated samples displayed considerable hardening over the unirradiated condition. DOE

N82-13223# Los Alamos Scientific Lab., N. Mex.
NEW WAYS OF LOOKING FOR PHASE TRANSITIONS AT MULTI-MEGABAR DYNAMIC PRESSURES
J. W. Shaner 1981 11 p refs Presented at the Conf. on High Pressure Phys., Bad Honnef, West Germany, Aug. 1981
(Contract W-7405-eng-36)
(DE81-028771; LA-UR-81-2082; CONF-810828-4) Avail: NTIS HC A02/MF A01

Three new techniques were applied to thermodynamic measurements behind a shock wave. Optical pyrometry was used to measure the temperature of shocked SiO_2. A temperature anomaly was found, indicating a phase change, probably melting, between 0.6 and 1.1 Mbar. Magnetic probes were used to measure the velocity of sound in shock compressed metals. Loss of a longitudinal elastic component of the sound wave is indicative of melting. An optical analyzer technique, exploiting the sensitivity of thermal radiation to small temperature changes, was used to measure sound velocity in shock compressed metals. With this derivative measurement both solid-solid and melting transitions of iron were detected. DOE

N82-13224# Los Alamos Scientific Lab., N. Mex.
THEORETICAL EQUATIONS OF STATE FOR METALS
G. I. Kerley 1981 6 p refs Presented at APS Conf. on Shock Waves in Condensed Matter, Menlo Park, Calif., 23 Jun. 1981
(Contract W-7405-eng-36)
(DE81-028743; LA-UR-81-2124; CONF-810684-42) Avail: NTIS HC A02/MF A01

Equation of state (EOS) calculations for xenon, iron, and beryllium are described and shown to give good agreement with shock wave experiments. The theory includes models for both solid and fluid phases, calculation of the melting curve, and effects of atomic shell structure on thermal electronic contributions to the EOS. DOE

N82-13225# California Univ., Livermore. Lawrence Livermore Lab.
OPTICAL POLISHING OF METALS
N. J. Brown, P. C. Baker, and R. T. Maney 29 Jul. 1981 16 p refs Presented at SPIE Intern. Symp., San Diego, 24 Aug. 1981
(Contract W-7405-eng-48)
(DE81-028690; UCRL-86514; CONF-810810-17) Avail: NTIS HC A02/MF A01

Metal polishing and fixed charge lap models are presented. Surface roughness of metals simultaneously polished on the same lap tended to vary inversely with Young's modulus. Electroless nickel wear rates with diamond, silicone oil, and pitch varied linearly with pressure and abrasive travel. Wear rates for the few samples run did not necessarily vary with just Young's modulus or hardness. It was not clear whether rates vary linearly with particle size. There was a distinct difference in the behavior of diamond and alumina on pitch laps. Alumina produced rougher surfaces than the corresponding size diamond on electroless nickel. There was a distinct difference between water and silicone oil as fluid lubricants on pitch laps. Roughness distributions on metals yielded Gaussian histograms for depth even on the smoothest specimens measured (similar effects are seen in glass). Data to support the above are provided. DOE

N82-13226# Electric Power Research Inst., Palo Alto, Calif.
WORKSHOP PROCEEDINGS: CORROSION OF INCONEL 600 STEAM GENERATOR TUBING IN THE TUBESHEET CREVICE
C. V. Hultman, R. G. Lucas, and J. P. N. Pane May 1981 362 p Workshop held in Palo Alto, Calif., 9-10 Sep. 1980
(DE81-903554; EPRI-WS-80-157; CONF-8009163) Avail: NTIS HC A16/MF A01

The proceedings of a workshop on the problem of the cracking and intergranular attack of Inconel 600 tubing in tubesheet crevices in nuclear reactor steam generators are presented. Objectives of the workshop were to: (1) focus on the problem; (2) identify and prioritize possible mechanisms; (3) focus on the testing necessary to analyze and describe the problem; (4) determine what remedial actions should be taken in the plants; (5) determine what else can be observed from plant data; and (6) attempt to treat the problem and not a symptom of the problem. A summary is presented along with each participant's material. DOE

N82-13227# Bureau of Mines, Rolla, Mo.
INSOLUBLE ANODES FOR ELECTROWINNING ZINC AND OTHER METALS
E. R. Cole, Jr. and T. J. OKeefe May 1981 31 p refs

(PB81-227365; BM-RI-8531) Avail: NTIS HC A03/MF A01 CSCL 11F

The polarization behavior of Pb-Ag anodes in H2SO4 and fluoride solutions was determined as the first step in the development of such an anode. A Luggin capillary, dc power supply, high-impedance voltmeter, and other equipment standard to an electrochemical laboratory were used. During polarization, a relatively hard, stable coating of PbO2 was formed on the surface of the lead-silver anode. The rate of formation was enhanced by the presence of fluoride ions in solution. Subsequent investigations resulted in the development of a PbO2-coated titanium anode. Additional data resulting from extensive testing of the anodes, as well as process improvements and innovations, are included. GRA

N82-13228 Ohio State Univ., Columbus.
STRESS CORROSION CRACKING OF TYPE 304 STAINLESS STEEL IN HIGH TEMPERATURE DILUTE CHLORIDE SOLUTION Ph.D. Thesis
Lifun Lin 1981 142 p
Avail: Univ. Microfilms Order No. 8121821

The susceptibility of sensitized type 304 stainless steel to stress corrosion cracking (SCC) in high temperature dilute chloride solution was studied using slow strain rate technique. When the electrode potential was more noble than a critical potential, intergranular stress corrosion cracking (IGSCC) was observed. At temperatures equal to or higher than 150 C simultaneous IGSCC and TGSCC occurs when the potential was above that for passivation breakdown. At temperatures below 150 C, IGSCC is accompanied by the occurrence of pitting potential. The activation energy for intergranular crack propagation is equal to 7 + or - 3 Kcal/mole. This indicates that the crack growth is controlled by mass transport process. It was found that using slow strain rate test, the total time to failure for a sensitized type 304 stainless steel was predominated by the initiation of an active crack. The threshold potential for arresting a propagating crack coincides with the critical potential for IGSCC obtained on originally smooth specimens. Dissert. Abstr.

N82-13229 Stanford Univ., Calif.
STRENGTHENING PHASES AND DEFORMATION MECHANISMS IN DISPERSION STRENGTHENED SOLID SOLUTIONS AND PURE METALS Ph.D. Thesis
Warren Carl Oliver 1981 150 p
Avail: Univ. Microfilms Order No. 8124124

The processing of aluminum powders to produce dispersion strengthened (DS) aluminum is studied. The dispersoid structures that form during mechanical alloying of aluminum is investigated, and structural changes that occur during subsequent heating are observed. Aluminum is produced by mechanical alloying (high energy ball milling) and subsequent hydrostatic extrusion. Mechanical properties of DS aluminum alloys, DS AlMg alloy, in particular are studied to observe the combined effects of dispersion strengthening and solute strengthening. The deformation characteristics of DS Al and DS AMg determined using constant crosshead speed compression tests and constant stress creep tests. Hard particles eliminate solute drag conrolled dislocation motion as a rate controlling mechanism for deformation. Even at relatively low temperature, the oxide particles in these alloys may deform and the deformation of the particles controls the deformation of the alloy. Dissert. Abstr.

N82-13230 Northwestern Univ., Evanston, Ill.
CYCLIC DEFORMATION AND FATIGUE MICROCRACK INITIATION IN PEARLITIC EUTECTOID STEEL Ph.D. Thesis
Hyun Sunwoo 1981 147 p
Avail: Univ. Microfilms Order No. 8125018

The cyclic softening and hardening behavior and the dislocation structural changes during cyclic deformation in a pearlitic eutectoid steel with variable interlamellar spacing is investigated, using controlled strain aging experiments. Transmission electron microscopic (TEM) observations are made on foils prepared from uncycled and cycled specimens. The initiation modes of surface fatigue microcracks are also examined by TEM using replicas and directly with scanning electron microscopy. The cyclic deformation behavior strongly depends on the interlamellar spacing with cyclic softening in the fine pearlite, cyclic hardening in the coarse pearlite, and both cyclic softening and hardening at low and high strain amplitudes, respectively, in the medium pearlite. Dissert. Abstr.

N82-13231 Northwestern Univ., Evanston, Ill.
DEFORMATION-ENHANCED PHOTOEMISSION FROM METALS Ph.D. Thesis
Tiruchengodu Krishna Ganapathy Swami 1981 145 p
Avail: Univ. Microfilms Order No. 8125019

Plastic deformation enhanced UV photoemission from oriented single crystal surfaces of aluminum is studied. Clean aluminum single crystals oriented in /111/direction are flexurally fatigued under ultrahigh vacuum conditions and for the first time photoelectron energy distribution curves are obtained as a function of fatigue cycles using the HeII(21.2 eV) and the HeII(40.8 eV) photon lines. A progressive decrease in work function is observed as the specimen is subjected to increasing number of fatigue cycles. Deformation enhanced photoemission behavior of oxide covered aluminum and other metals is also investigated using photons from a mercury arc lamp (photon energy 5.0, 5.1 or 5.2 eV). Initially, Al(100) and Al(111) faces are exposed to oxygen and the photocurrent measured as a function of exposure. On both the faces photocurrent increases initially, reaches a maximum and then starts to fall very slowly with oxygen exposure. Dissert. Abstr.

N82-13232 Florida Univ., Gainesville.
MATHEMATICAL MODEL OF DIFFERENTIAL REFLECTOMETRY FOR USE IN THE INVESTIGATION OF THIN FILM CORROSION PRODUCTS Ph.D. Thesis
Frank Karl Urban, III 1981 173 p
Avail: Univ. Microfilms Order No. 8124460

Maxwell's equations without any simplifying assumptions were used in a model developed to produce computer calculated differential reflectograms (difference in reflectivity as a function of photon energy) which were compared with experimentally obtained reflectograms. The calculated differential reflectograms are distinguished by a sequence of interference peaks if the product of film thickness and index of refraction of the corrosion product film is greater than 40 nanometers. For an oxide film thickness below this critical value, no interference peaks are expected. High purity tungsten was chosen for the primary experimental thrust. Chromium, molybdenum, zinc, magnesium and copper also were investigated. Matching the calculated and experimental reflectograms leads to the identification of the source of each peak, the establishment of the interband peak energies and the determination of optical constants and thicknesses of the film. Dissert. Abstr.

N82-13233 Stanford Univ., Calif.
A STUDY OF THE SURFACE REACTIVITY OF SILVER: AN ACID BASE CHARACTERIZATION OF OXIDATION REACTIONS Ph.D. Thesis
Mark Alan Barteau 1981 474 p
Avail: Univ. Microfilms Order No. 8124031

The absorption of oxygen on the Ag(110) surface and the reactions of oxygen with organic compounds were examined. Above 150K oxygen was dissociatively adsorbed on the surface, below this temperature an adsorbed molecular species was also present. The reactivity of adsorbed oxygen atoms was characteristics of an acid-base reaction. Adsorbed bases included formate, acetate, mono-dentate acetylide, bi-dentate acetylide, and hydroxyl. These species could be stoichiometrically titrated from the surface by stronger acids to yield the parent acids plus the adsorbed conjugate base of the stronger acid. The order of acidity on the Ag(110) surface was determined to be: 1,2 formic acid, acetic acid; 3 ethanol; 4 acetylene; 5 methanol; 6,7 water, propylene; 8,9,10 hydrogen ethylene, ethane. Little perturbation of the orbitals expected for gas phase anions was observed to arise from the interaction with the surface. Dissert. Abstr.

N82-13281*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELEVATED TEMPERATURE FATIGUE TESTING OF METALS
Marvin H. Hirschberg *In* AGARD Fatigue Test Methodology

Oct. 1981 18 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

N82-13283# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
METHODS OF OBTAINING CRACK GROWTH DATA IN METALS
P. R. Edwards *In* AGARD Fatigue Test Methodology Oct. 1981 22 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

N82-13285# Waterloo Univ. (Ontario). Dept. of Civil Engineering.
CYCLIC STRAIN APPROACH TO FATIGUE IN METALS
T. H. Topper and P. Au *In* AGARD Fatigue Test Methodology Oct. 1981 25 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N82-13234 Lowell Univ., Mass.
POLYMERS WITH MESOMORPHIC ORGANIZATION IN THE SIDE CHAINS FROM VINYL MONOMERS WITH MESOGENIC OR POTENTIALLY MESOGENIC ELEMENTS Ph.D. Thesis
Lee-Kiat Lim 1981 172 p
Avail: Univ. Microfilms Order No. 8124825

Monomers and their saturated analogs containing mesogenic or potentially mesogenic elements in the side chains were synthesized. Polymerization of the monomers was carried out in the mesomorphic and isotropic melt states and in solution. The polymers prepared were characterized by means of IR, viscometry, TMA, C13-NMR, X-ray diffraction and polarizing microscopy. Polymerization of MBABA in the mesomorphic phase was found to influence polymer tacticity. Polymerization of non-mesomorphic MBnBA resulted in a polymer exhibiting enantiotropic mesomorphism. Differential scanning calorimetry was evaluated and found to be a useful new tool for the determination of polymerization rate. Dissert. Abstr.

N82-13235 Polytechnic Inst. of New York, Brooklyn.
STUDIES OF POLYMER COMPATIBILITY BY NONRADIATIVE ENERGY TRANSFER Ph.D. Thesis
Ju-Ming Hung 1980 135 p
Avail: Univ. Microfilms Order No. 8118877

The excitation energy of a donor can be transferred to an acceptor when the emission spectrum of the donor overlaps the absorption spectrum of the acceptor. Polymers were prepared containing the comonomers, 2-(N-carbazolyl)ethyl methacrylate and 9-anthrylmethyl methacrylate as fluroescence donors and acceptors, respectively. The mutual interpenetration of the polymer chains carrying the donor and the acceptor led to a sharp increase of excitation energy transfer characterized by the relative emission intensities at 347 nm and 413 nm, the emission maxima of the carbazolyl and the anthryl chromophores, when the system was irradiated at 296 nm. The critical transfer distance R0 = 2.7 nm to 2.9 nm was calculated from spectroscopic parameters. However R0 = 3.6 nm was obtained from the quenching of the donor fluorescence at increasing acceptor concentrations when 2-(N-carbazolyl)ethyl acetate and 9-anthryl methyl acetate were incorporated in polymer films. The polymer blends of poly(styrene co acrylonitrile) with poly(methyl methacrylate) were studied by energy transfer method. The angle of compatibility indicated by the fluroescence technique was similar, but slightly narrower than estimated from the optical clarity. Dissert. Abstr.

N82-13236 Polytechnic Inst. of New York, Brooklyn.
FLAMMABILITY AND PHOTO-STABILITY OF SELECTED POLYMER SYSTEMS Ph.D. Thesis
Jeelin Lo 1981 142 p
Avail: Univ. Microfilms Order No. 8118883

A systematic approach to the improvement of the flammability of epoxy resins, bisphenol-A polycarbonate, poly(butylene terephthalate), and Nylon 6.6 by introducing halogens and loop functionality into the flame retardants is described. The investigation of the thermal properties of the char-forming phenol-formaldehyde resins was conducted to provide information for the systematic design of high temperature flame-resistant phenolics. The differences in structure of the cured resins were observed from the FT-IR spectra. The s-trioxane cured resins contain long chain ethers and cyclic acetals along with the methylene linkages. In the study of the photo-Fries rearrangement the fluorene-based polyarylates prepared included 9,9-bis (4-hydroxy phenly) fluorene isophthalate (BPF-I), 9,9-biscresol fluorene isophthalate (BCF-I), and 9,9-bis (3,5-dimethyl-4-hydroxy phenyl) fluorene isophthalate (BDMPFI). Dissert. Abstr.

N82-13237 Seton Hall Univ., South Orange, N. J.
GAS-SOLID CHROMATOGRAPHY ON CATION FORMS OF LIGHTLY SULFONATED POROUS POLYMERS Ph.D. Thesis
Robert John Gaydosh 1981 266 p
Avail: Univ. Microfilms Order No. 8122397

Porapak Q, an ethyl vinyl benzene - divinyl benzene copolymer resin, lightly sulfonated and converted to various cationic forms for use as a packing in gas-solid chromatography (GC). These packings are an improvement over regular ion exchange resins for GC work. These resins are easily prepared, are stable at high temperatures, and the various metal forms of the resins offer a variety of diversified packings. The sulfonic acid content of the resin is closely controlled and with it, the amount of metal exchanged onto the resin. The stability of the silver form of the resin is particularly advantageous because this metal's strong affinity for unsaturated centers is utillized to separate these type compounds, and to study the physical interactions between the two. Dissert. Abstr.

N82-13238 North Carolina State Univ. at Raleigh.
EFFECT OF SOLVENTS ON THE RADIATION-INDUCED POLYMERIZATION OF ETHYL AND ISOPROPYL VINYL ETHERS Ph.D. Thesis
Wen-Chyi Hsieh 1981 112 p
Avail: Univ. Microfilms Order No. 8121731

The effect of solvents on the radiation-induced cationic polymerization of ethyl and isopropyl vinyl ethers (EVE and IPVE, respectively) was investigated. EVE and IPVE polymerizations were carried out in bulk and in solution under superdry conditions in which polar impurities, especially water, were reduced to negligible levels. Plots of the monomer conversions and irradiation times were obtained for EVE and IPVE polymerizations in bulk and in benzene solution at constant monomer concentrations. The results show that solvation of the propagating cation by the monomer molecules is insignificant. The monomer concentration dependence of the polymerization rate was studied for EVE polymerization in bulk and in benzene, diethyl ether, diglyme and methylene chloride, and for IPVE polymerization in bulk and in benzene. Solvent effect on the estimated propagating rate constants was examined for EVE and IPVE polymerization in bulk and in solution. The Laidler-Eyring theory, through evaluation of electrostatic forces of reaction media, could better predict the effect of polar solvents in IPVE polymerization than in EVE polymerization. The effect of temperature on the polymerization rate was also investigated. Dissert. Abstr.

N82-13239 Michigan Univ., Ann Arbor.
STRAIN-INDUCED CRYSTALLIZATION OF POLYMERS Ph.D. Thesis
Kuo-Zong Hong 1981 282 p
Avail: Univ. Microfilms Order No. 8122777

A nucleation theory was formulated to account for the behavior of polymer crystallization under molecular strain or orientation. The enhancement of nucleation rate, the elevation of melting temperature, and the decrease in critical nucleus size were quantitatively predicted as a function of molecular strain. Crystalline kinetics, melting behavior, and morphology were experimentally determined and the interrelationships were explored. Effects of shear rate, crystallization temperature, molecular weight, and chemical structure were investigated. It was found that the nucleation rate, in terms of the reciprocal of

induction time, increases with shear rate and decreases with temperature. The findings in kinetics, melting behavior, and morphology are consistent with each other in terms of the proposed theory, indicating that they all stem from the same origin: molecular strain, and thus entropy reduction.
Dissert. Abstr.

N82-13240 Wisconsin Univ. - Madison.
STRUCTURE-PROPERTY RELATIONSHIPS IN SEGMENTED ELASTOMERS: SMALL ANGLE X-RAY SCATTERING, THERMAL, AND MECHANICAL STUDIES Ph.D. Thesis
John William Chapman VanBogart 1981 566 p
Avail: Univ. Microfilms Order No. 8117545

The structure-property relationships of a series of polyether and polyester polyurethanes and polyether-polyester segmented copolymers were studied as a function of hard-segment type, soft-segment type, segment length, hard-segment content, segment length polydispersity, and material thermal history. The model presented for the morphology of the semi-crystalline polyurethane materials suggests cylindrical or parallelipiped-shaped hard-segment crystallies with low axial ratios. The model for the H12 MDI-based polyurethanes involves spherical regions of amorphous hard-segments. Polyether polyurethanes were shown to have more complete phase separation than equivalent polyester-based polyurethanes. Annealing was shown to improve the degree of phase separation in more compatible systems of segmented polyurethane elastomers. Hard-segment domain size and interfacial thickness were roughly twice as large the direction of stretch than transverse to it in semicrystalline materials. In genera, annealing resulted in an endothermic peak at a temperature 20 deg to 50 deg above that of the temperature of annealing in both semicrystalline and amorphous materials. Dissert. Abstr.

N82-13241 Northwestern Univ., Evanston, Ill.
A STUDY OF THE DYNAMIC AND TRANSIENT PROPERTIES OF POLYMER SOLUTIONS Ph.D. Thesis
Christine Mary Jarzebski Vrentas 1981 211 p
Avail: Univ. Microfilms Order No. 8125028

A rheometrics mechanical spectrometer was used to study the dynamic and transient properties of polymer solutions. Dynamic moduli were measured using both a parallel plate oscillatory experiment and a stead state experiment conducted with an eccentric rotating disk (ERD) apparatus. Shear stress and normal stress relaxation data on polymer solutions were obtained with a cone and plate step shear strain experiment. These data were used to test nonlinear phenomenological and molecular constitutive theories. These experiments were conducted primarily linear and branched polybutadienes and their solutions. A computerized oscillatory experiment was developed to produce dynamic data against which ERD results could be compared. A computerized stress relaxation experiment was developed to produce reliable shear stress and normal stress relaxation data. The applicability of simple fluid theory to the rheology of polymer solutions was confirmed.
Dissert. Abstr.

N82-13242 Wisconsin Univ. - Madison.
ELECTROSTATIC AND HYDRODYNAMIC INTERACTIONS OF CHARGED MACROMOLECULAR SYSTEMS Ph.D. Thesis
David Michael Piatt 1981 271 p
Avail: Univ. Microfilms Order No. 8120325

A variety of light scattering techniques, elastic, quasielastic, and electrophoretic quasielastic is used to characterize charged macromeolecular systems. The use of these techniques to characterize several biological and synthetic macromolecules is described. These samples include amphuteric latex particles, bovine rod outer segment disk membranes, concentrated protein solutions, and DNA dependent RNA polymerase. An amphoteric latex system was prepared by a surfactant free emulsion polymerization of styrene, methacrylic acid, and beta-N,Ndiethy amino ethyl methacrylate. It is found that the radius varies from 101 to 124 nm as the pH is varied from 7 to either 3 or 11. A similar, but smaller, change is observed in the Stokes radius, as determined by quasielastic light scattering. Electrophoretic quasielastic light scattering shows that the change in the magnitude of the electrophotoretic mobility is symmetric about a pH slightly less than 7 (6.7-6.8). A simple concentric sphere model is presented which can qualitatively account for these changes.
Dissert. Abstr.

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N82-13243*# Engineering Societies Commission on Energy, Inc., Washington, D. C.
BARRIERS TO THE UTILIZATION OF SYNTHETIC FUELS FOR TRANSPORTATION Final Report
Harry W. Parker and Matthew J. Reilly Oct. 1981 25 p
(NASA Order C-57307-D; Contract DE-AI01-81CS-50006)
(NASA-CR-165517; DOE/NASA-7307/1) Avail: NTIS HC A02/MF A01 CSCL 21D

The principal types of engines for transportation uses are reviewed and the specifications for conventional fuels are compared with specifications for synthetic fuels. Synfuel processes nearing the commercialization phase are reviewed. The barriers to using synfuels can be classified into four groups: technical, such as the uncertainty that a new engine design can satisfy the desired performance criteria; environmental, such as the risk that the engine emissions cannot meet the applicable environmental standards; economic, including the cost of using a synfuel relative to conventional transportation fuels; and market, involving market penetration by offering new engines, establishing new distribution systems and/or changing user expectations.
T.M.

N82-13244# California Univ., Livermore. Lawrence Livermore Lab.
SOVIET UCG EXPERIENCE SPECIFICALLY RELATED TO FIELD EXPERIMENTS IN THE UNITED STATES
D. U. Olness 8 Jul. 1981 6 p refs Presented at 7th Underground Coal Conversion Symp., Fallen Leaf Lake, Calif., 8 Sep. 1981
(Contract W-7405-eng-48)
(DE81-028642; UCRL-85919; CONF-810923-6) Avail: NTIS HC A02/MF A01

Soviet experiences with problems in underground coal gasification experiments reveal similarities to problems encountered in the United States. Aerodynamic considerations and problems with hole failure, override, reverse burn links, and other coal conversion/extraction related difficulties are discussed.
M.D.K.

N82-13245# Oak Ridge National Lab., Tenn.
H-COAL PRODUCT PHYSICAL PROPERTIES MEASUREMENT Final Report
D. D. Lee Aug. 1981 21 p refs
(Contract W-7405-eng-26)
(DE81-029095; ORNL/TM-7915) Avail: NTIS HC A02/MF A01

Rheological and density measurements have been made on the H-Coal PDU reactor effluent samples, which used Wyodak coal. Characterization was done in the ORNL Coal Liquids Flow System. Apparent viscosities and shear rates were observed. The rheological data were fitted to both power law and Bingham plastic models. The apparent viscosities appeared to correlate to the amount of solids in the samples.
DOE

N82-13246# Battelle Columbus Labs., Ohio.
SYNTHETIC FUEL AROMATICITY AND STAGED COMBUSTION Quarterly Technical Progress Report, 1 Apr. - 30 Jun. 1981
A. Levy, J. R. Longanbach, and L. K. Chan 30 Jul. 1981 24 p refs
(Contract DE-AC22-80PC-30302)
(DE81-024205; DOE/PC-30302/3; QTPR-3) Avail: NTIS HC A02/MF A01

Analytical data for narrow solvent refined coal (SRC 2) distillation cuts were compared and found to show similar trends. The precision of the basic nitrogen procedure was found to be within + or - 1% of the basic nitrogen content. A nuclear magnetic

resonance method for structural parameter characterization was implemented. An aromatic gas chromatograph (GC) standard was prepared for use in the simulated distillation by GC analyses. A GC column was used to show the sample changes which occur during pyrolysis. Exploratory experiments, carried out to determine the conditions of time and temperature under which the SRC 2 distillation cuts would pyrolyze, were conducted by vaporizing the SRC 2 cut, mixing the fuel vapor with helium, and then passing the mixture into the heated reaction zone. A set of analyses was obtained on the liquid products from pyrolysis at 800 C of 200 to 250 C SRC 2 distillation cut using two different residence times. Time and temperature exposure difficulties complicated data interpretation. Gas analyses showed the presence of hydrocarbon, HCN, NH3, and N2 in the gas phase. DOE

N82-13247# Burns and Roe Industrial Services Corp., Paramus, N. J.

LOW/MEDIUM BTU COAL GASIFICATION ASSESSMENT PROGRAM FOR POTENTIAL USERS IN NEW JERSEY: EXECUTIVE SUMMARY

May 1981 21 p refs

(Contract DE-AC01-79RA-20216)

(DE81-025475; DOE/FE-20216/1) Avail: NTIS HC A02/MF A01

The production of medium Btu quality gas (MBG) for use as fuel for on-site power plant boilers or for distribution to industrial customers appeared to be economically attractive, dependent upon the proximity of sufficient numbers of industrial customers and upon high plant utilization. The Texaco Coal Gasification Process (TCGP) was selected, being a pressurized process capable of supplying the gas without downstream compression. The TCGP could handle the high sulfur eastern coals chosen as a feedstock. All equipment downstream of the gasifier was commercially proven. The integration of the gasification process with a methanol synthesis plant, consuming up to 25% of the MBG produced, was desirable in order to allow storage of MBG during low demand and thereby increase the gasifier capacity factor and minimize its turndown requirements. DOE

N82-13248# Combustion Engineering, Inc., Windsor, Conn.

LOW-BTU GASIFICATION OF COAL FOR ELECTRIC POWER GENERATION, PHASE 1, 2, AND 3 Monthly Progress Report, 1 Apr. - 30 Apr. 1981

16 Aug. 1981 46 p refs

(Contract DE-AC01-76ET-10204)

(DE81-029482; DOE/ET-10204/T1; FE-1545-89) Avail: NTIS HC A03/MF A01

Oxygen-enriched operation of the Pressure Distribution Unit was initiated on April 1, 1981. Eleven oxygen enriched gasmaking tests were made during the month. These tests were interrupted upon eight occasions by slag tap pluggage or imminent pluggage. A 15 to 20 day opuations text was begun during the month, but not successfully completed owing to the tap hole pluaggage problems. Iron reduced from the slag due to the low oxygen concentration in this region was the most obvious explanation for the tap hole pluggages. DOE

N82-13249# Mason and Hanger-Silas Mason Co., Inc., Amarillo, Tex.

EVALUATION OF LOW-CHLORINE TATB FROM A PRODUCTION SOURCE

T. L. Stallings, A. Gordon Osborn, Herb D. Johnson, Arnie A. Duncan, and Clifford L. Schaffer Aug. 1981 25 p

(Contract DE-AC04-76DP-00487)

(DE81-025474; MHSMP-81-34; PDE-208; SANL-905-002) Avail: NTIS HC A02/MF A01

Six production lots of low-chlorine TATB powder were evaluated. Five of the lots were made by a wet-amination process and the other was made by an emulsion-amination process. LX-17 physical properties specimens made from the five wet-aminated TATB lots were exceptionally strong and comparable to dry-aminated TATB, while the emulsion-aminated lot of TATB had lower strength. DOE

N82-13250# Sandia Labs., Albuquerque, N. Mex. Initiating and Pyrotechnic Components Div.

REVIEW OF LOW-VOLTAGE CP DETONATORS

M. L. Lieberman, F. J. Villa, D. L. Marchi, A. L. Lause, D. Yates, and J. W. Fronabarger 1981 25 p refs Presented at the 11th Symp. on Explosives and Pyrotechn., Philadelphia, 15 Sep. 1981 Prepared jointly with Unidynamics/Phoenix, Inc.

(Contract DE-AC04-76DP-00789)

(DE81-025837; SAND-81-0245C; CONF-810926-1) Avail: NTIS HC A02/MF A01

The compound 2-(5-cyano tetrazolato) penta ammine cobalt(III) perchlorate (CP) was developed to provide a relatively safe explosive material for low-voltage, hot-wire detonators. The design and development of CP detonators, and data on their performance are presented. Explosive CP was incorporated into a variety of low voltage deflagration-to-detonation transition (DDT) type detonators designed to have high density powder in the ignition region and low density powder in the DDT region. Devices were developed which meet 1 amp/1 watt no-fire and 3.5 amp all-fire requirements with high reliability. Detonation is achieved with high reliability at distances from the bridgewire of < 1/4 inch. Specific detonators were fabricated that are small and capable of withstanding high shock loads, long-term temperature extremes, and short-term high-temperature excursions. DOE

N82-13251# Sandia Labs., Albuquerque, N. Mex. Initiating and Pyrotechnics Div.

PERFORMANCE OF CHEMICAL ANALOGS OF THE EXPLOSIVE CP

J. W. Fronabarger, W. Fleming, and M. L. Lieberman 1981 31 p refs Prepared jointly with Unidynamics/Phoenix

(Contract DE-AC04-76DP-00789)

(DE81-025836; SAND-81-0246C; CONF-810926-2) Avail: NTIS HC A03/MF A01

The development and weapons systems application of 2-(5-cyano tetrazolato) penta ammine cobalt (III) perchlorate, designated CP, for low voltage detonators, was studied to arrive at materials superior to CP in performance and sensitivity characteristics. Desired improvements included shorter deflagration-to-detonation transition (DDT) distances and lower electrostatic discharge (ESD) sensitivity in the confined, pressed state. Synthesis, analytical, and explosive testing activities, using 12 materials are presented. Several substituted (CP and CP analogs) undergo DDT directly from hot wire ignition. Some of the CP analogs exhibit DDT tendencies equivalent or superior to CP. The degree of DDT for the analogs is inversely proportional to density; none of the analogs studied were ESD sensitive, however, for the confined pressed form, the materials were ignitable from ESD. Many analogs showed lower ESD sensitivity than CP which suggests that safer detonators can be developed. Thermal response characteristics of the analogs varied somewhat, with exothermic activities. DOE

N82-13252# Ultrasystems, Inc., Irvine, Calif.

FEASIBILITY STUDY REPORT FOR THE IMPERIAL VALLEY ETHANOL REFINERY: A 14.9-MILLION-GALLON-PER-YEAR ETHANOL SYNFUEL REFINERY UTILIZING GEOTHERMAL ENERGY

Mar. 1981 202 p Prepared in cooperation with U.S. Alcohol Fuels, East Mesa, Calif.

(Contract DE-FG07-80RA-50308; Proj. 1013)

(DE82-000288; DOE/RA-50308/1) Avail: NTIS HC A10/MF A01

The construction and operation of a 14,980,000 gallon per year fuel ethanol from grain refinery is proposed. The refinery will use hot geothermal fluid from geothermal resources as the source of process energy. In order to evaluate the economic viability of the proposed project, exhaustive engineering, cost analysis, and financial studies were undertaken. The results of feasibility studies undertaken in geothermal resource, engineering, marketing financing, management, environment, and permits and approvals are presented. The project was found to be economically viable. DOE

N82-13253# Staatliches Forschungsinstitut fuer Geochemie, Bamberg (West Germany).

INVESTIGATIONS TOWARDS THE UNDERSTANDING OF SURFACE TREATMENT OF PROPELLANT GRAINS BY MEANS OF TRACE ELEMENTS [UNTERSUCHUNGEN ZUR ERFASSUNG DER OBERFLAECHENBEHANDLUNG VON

TREIBLADUNGSPULVERN MITTELS MARKIERTER SUBSTANZEN]
H. Meier, D. Boesche, G. Zeitler, E. Zimmerhackl, W. Hecker, and U. Tschirwitz Bonn Bundesministerium der Verteidigung 1979 101 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung
(BMVG-FBWT-79-14) Avail: NTIS HC A06/MF A01; DOK-ZENTW, Bonn DM 30

The migration of deterrents into nitrocellulose grains is studied by means of the carbon 14 radiotracer technique. Such deterrents improve the internal ballistic properties of propellants and influence barrel erosion. The distribution of the deterrent compounds was measured by profile sectioning in conjunction with beta scintillation metering. The measurements yield values for diffusion coefficients, activation energies, and frequency factors as well as for scaling laws of the migration behavior with respect to temperature, time and concentration. A model of the migration mechanism, assuming a moving boundary, is established consistent with the available data. Author (ESA)

N82-13254# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
TEST NUMBER 2 OF PROPELLANTS FOR ROCKET MOTOR E573
Anders Schwartz May 1981 51 p refs In SWEDISH; ENGLISH summary
(FOA-C-20411-D1) Avail: NTIS HC A04/MF A01

The propellants tested are 85 months old. Properties were compared with properties from the first test on 32 months old propellants. Chemical stability is good. Tensile tests show small changes at low temperatures and high strain rates. The propellants possibly become a little stiffer. The adhesion of the inhibitor decreases considerably, especially the adhesion to propellant D23 where a decrease of about 43% was measured. The adhesion to propellant D28 decreases about 17%. Hardness and burning rate are not altered. Author (ESA)

N82-13255# Comptroller General of the United States, Washington, D.C.
NATURAL GAS PLAN NEEDED TO PROVIDE GREATER PROTECTION FOR HIGH-PRIORITY AND CRITICAL USES Report to the Congress
23 Mar. 1981 57 p
(PB81-228488; EMD-81-27) Avail: NTIS HC A04/MF A01 CSCL 21D

Natural gas legislation and programs implemented over the past decade and currently ongoing at the Federal, state, and local levels are discussed. Some of the shortcomings, inconsistencies, and incompatibilities between legislative intent and program implementation at the various levels are highlighted. GRA

N82-13256# Bechtel Power Corp., San Francisco, Calif.
ENVIRONMENTAL AND ECONOMIC COMPARISON OF ADVANCED PROCESSES FOR CONVERSION OF COAL AND BIOMASS INTO CLEAN ENERGY Final Report, Sep. 1977 - Dec. 1978
R. A. Stenzel, B. T. Kown, M. C. Weekes, J. D. Ruby, B. R. Gilbert, C. M. Harper, Y. G. Yim, and R. T. Milligan Aug. 1981 402 p refs
(Contract EPA-68-02-2616)
(PB81-234239; EPA-600/7-81-133) Avail: NTIS HC A16/MF A01 CSCL 21D

Biomass and coal conversion into clean energy is compared on an economic and environmental basis in three regional scenarios: (1) electric power from direct combustion of wood versus conventional coal combustion; (2) synthetic pipeline gas from anaerobic digestion of wheat straw and manure versus high-Btu gasification of coal (HYGAS); and (3) synthetic fuel oil from wood liquefaction versus coal liquefaction (H-Coal). Conceptual commercial-scale plants are described. Capital and operating costs are presented for each of the six plants, and the biomass versus coal economics are compared. General environmental impacts of biomass and coal resource collection are assessed and compared in the scenario contexts. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N82-13257 Northwestern Univ., Evanston, Ill.
EFFECTIVE STRESS-STRAIN-STRENGTH BEHAVIOR OF SILICATE-GROUTED SAND Ph.D. Thesis
Mohamed Adel Benltayf 1981 257 p
Avail: Univ. Microfilms Order No. 8124852

The effective stress concept was used to interpret the results of drained and undrained triaxial compression tests on grouted sand specimens which were grouted under at-rest conditions or under a confining stress. The behavior of grouted and ungrouted sand in drained and undrained shear was documented in terms of stress-strain, volume change, pore pressure, shearing resistance, and shear strength characteristics. The behavior of grouted sand in unconfined compression was analyzed. Specimens tested in triaxial compression after curing for six or more days exhibit no appreciable differences in stress-strain, volume change, pore pressure, and shear strength behavior. Grouting improves the stiffness and strength of ungrouted sand. The shearing resistance of silicate grouted sand is generated by cohesion and friction components which vary as a function of axial strain. The strength of grouted sand is greatly affected by drainage conditions and pore pressures. Dissert. Abstr.

N82-13258 Stanford Univ., Calif.
MICROMECHANICS OF EXPANSIVE MECHANISMS IN EXPANSIVE CEMENT CONCRETES Ph.D. Thesis
Menashi David Cohen 1981 219 p
Avail: Univ. Microfilms Order No. 8124049

The kinetics of hydration were studied by monitoring the presence of various compounds by X-ray diffractometer, a chemical extraction method, and scanning electron microscope. These studies indicated that the rates of depletion of the expanding particles and sulfates are higher in the finer blends, which is why expansion stops earlier in these blends. It is shown that the double curvature phenomenon (strength-drop and sudden increase in the rate of expansion) is caused by mechanical failure (e.g., microcracking) of the matrix surrounding the expanding particles that are producing ettringite crystals. The theory of protective and partial protective coating is reviewed. A hypothesis is introduced which assumes that monosulfate is not formed immediately when ettringite stops forming but is preceded by an intermediate phase. Shrinkage studies show that expansive cements shrink more than portland cements. The results of these studies were used to develop a modified model of the expansive process. It was shown theoretically that the time of expansion is inversely proportional to the surface area of the expansive clinker and directly proportional to the amount of sulfate used. Dissert. Abstr.

N82-13259 Missouri Univ. -Rolla.
PARAMETRIC STUDY OF SILO-MATERIAL INTERACTION Ph.D. Thesis
Ghazi Saleh Hasanain 1981 169 p
Avail: Univ. Microfilms Order No. 8123583

The methods for determination of pressures and the analysis of silos for storage of granular materials are reviewed. A finite element procedure for linear analysis and an initial-strain analysis of hoop forces and horizontal bending moments in circular concrete silos with bisymmetric outlets is presented, and these methods are compared with the hoop steel areas obtained using current practice. A concrete coal silo is designed by these methods and compared with one designed by standard methods. Dissert. Abstr.

N82-13260# Drexel Univ., Philadelphia, Pa. Dept. of Materials Engineering
RAPID CYCLE CASTING OF STEEL Final Report, 1 Jul. 1977 - 31 Aug. 1980
Diran Apelian and G. Langford Jul. 1981 533 p refs
(Contract DAAG29-77-C-0028; ARPA Order 3397)
(AD-A103567) Avail: NTIS HC A23/MF A01 CSCL 13/8

A rapid cycle casting process for steel via diffusion solidification (SD) is developed. Solidification takes place by carbon

redistribution between iron saturated high carbon liquid iron and low carbon preexisting solid iron in a refractory mold. The solidification time is shorter and the economic scaling law is less dependent on the size of the casting than in conventional casting processes. The metallurgical and processing aspects of SD casting are addressed and the necessary parameters are developed to design a rapid cycle casting machine. These process parameters in addition to the metallurgical quality variables are included in an economic feasibility analysis of the SD process. GRA

N82-13261# Naval Research Lab., Washington, D. C. Thermostructural Materials Branch.

PRELIMINARY EVALUATION OF ION IMPLANTATION AS A SURFACE TREATMENT TO REDUCE WEAR OF TOOL BITS Interim Report

F. A. Smidt, J. K. Hirvonen (Georgia Inst. of Technology, Atlanta), and S. Ramalingam 25 Sep. 1981 57 p refs (RR0221141)

(AD-A105053; NRL-MR-4616) Avail: NTIS HC A04/MF A01 CSCL 13/8

The process of ion implantation is reviewed and concepts for use as a surface hardening technique for extending the life of machine tools are explored. It is concluded that for high speed steel tool materials a system based on implantation of Ti ions with subsequent reaction to form TiC in the surface layers should have merit. Exploratory tests showed that in machining tests of 4140 steel, an implanted M2 lathe tool bit required about 10 percent less power and has a wear rate approximately one half that of the unimplanted tool. Tests of end mills proved inconclusive because the optimum Ti level for the implant was not reached. Author

N82-13262# Naval Civil Engineering Lab., Port Hueneme, Calif.

COMPUTER PROGRAM FOR OPTIMUM NONLINEAR DYNAMIC DESIGN OF REINFORCED CONCRETE SLABS UNDER BLAST LOADING (CBARCS) Final Report

John M. Ferritto, Robert M. Wamsley (Army Engineer Div., Huntsville, Ala.), and Paul K. Senter (Army Engineer Waterways Experiment Station, Vicksburg, Miss.) Mar. 1981 85 p refs (AD-A104253; WES-INSTRUCTION-K-81-6) Avail: NTIS HC A05/MF A01 CSCL 13/13

The user's guide for CBARCS, a computer program for optimum nonlinear dynamic design of reinforced concrete slabs under blast loading, is presented. Given the explosive parameters and geometry of the slab, CBARCS computes the blast environment and the structural resistance, mass, and stiffness of the slab and solves for the dynamic response. The program contains optimization subroutines that provide for automatic optimum design of least cost structural slabs. CBARCS will assist engineers in the design and analysis of facilities that are intended to contain the effects of accidental explosion. Author

N82-13263# California Univ., Livermore. Lawrence Livermore Lab.

ULTIMATE IN BUILDING ENERGY ANALYSIS: DOE-2 AND BLAST

B. D. Hunn 1981 33 p refs Presented at the Symp. Energy and Big Building Design, Philadelphia, 25-26 May 1981 Submitted for publication

(Contract W-7405-eng-36)

(DE81-028703; LA-UR-81-2288; CONF-8105107-1) Avail: NTIS HC A03/MF A01

The DOE-2 and BLAST computer programs are investigated in terms of their usefulness in building energy analysis. DOE-2 and BLAST are generally classed as high-level, computer-dynamic methods that are based on hour-by-hour computation. The characteristics of DOE-2 and BLAST are discussed with emphasis on their solar simulation features, and their capabilities are contrasted and related. Typical applications of the programs to the retrofit of existing buildings and the design of new buildings, are presented. The passive solar retrofit of an office building, the use of DOE-2 as a predesign analysis tool, and the use of BLAST in a research and development application are all described. Future directions in research and development needs for high level building energy analysis tools and the progress being made toward increased use of these tools are discussed. DOE

N82-13264# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

ELECTRIC COHEATING EXPERIMENT TO DETERMINE THE HEAT-LOSS COEFFICIENT OF A DOUBLE-ENVELOPE HOUSE

Joseph K. E. Ortega, John V. Anderson, J. Michael Connolly, and Carl E. Bingham Jul. 1981 7 p refs Presented at the AS/ISES 6th Natl. Passive Solar Conf., Portland, Oreg., 8-12 Sep. 1981

(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)

(DE81-027937; SERI/TP-1316; CONF-810925-11) Avail: NTIS HC A02/MF A01

An electric coheating experiment was conducted on a double envelope house to determine the total test loss coefficient of the double shelled structure, as well as the heat loss coefficients of the inner and outer shells. Electric coheating is fairly well established as an experimental method for determining the total heat loss coefficient in conventional residential buildings. However, special problems were introduced with passive and double envelope buildings. A methodology was developed to meet these problems. That methodology and the results of the experimental investigation are presented and discussed. DOE

N82-13265# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

APPLIANCE EFFICIENCY AND THE SOLAR BUILDING

Joel Swisher Jun. 1981 30 p refs

(Contracts EG-77-C-01-4042; DE-AC02-77CH-00178)

(DE81-029073; SERI/TR-721-1119) Avail: NTIS HC A03/MF A01

Energy use in residential appliances is examined. Current appliance energy use was evaluated and technologically feasible improvements were studied. A typical set of household appliances was developed, and modified by three classes of efficiency improvements. Significant energy saving potential was found in all major appliance energy uses, with the largest savings in water heaters and refrigerators. Costs of the improvements are relatively low, providing short payback times. The effects of the improvements on building thermal loads and electricity demand profiles were also examined. DOE

N82-13266# Louisiana Dept. of Transportation and Development, Baton Rouge.

EVALUATION OF REEF SHELL EMBANKMENT Final Report, Aug. 1976 - Dec. 1980

James L. Melancon and Steve G. Bokun Dec. 1980 75 p refs Sponsored in part by DOT

(PB81-232761; LA-77-1S-B; FHWA/LA-81/129) Avail: NTIS HC A04/MF A01 CSCL 13B

A method of constructing an embankment over marshland soils by end-dumping reef shell directly onto the marshland with no other major subgrade preparation is discussed. The dumped reef shell is then spread out to form a 'floating' embankment over the soft marshland. The subsidence characteristics of a reef shell embankment are compared with those of a clam shell embankment to determine if such a reef shell embankment would provide adequate structural support for traffic. Results show it is physically and economically feasible to construct a reef shell embankment on soft organic marshland soils. A properly constructed reef shell embankment develops into a homogeneous floating slab of substantial stability and strength capable of supporting allowable traffic loads. GRA

N82-13267# Connecticut Dept. of Transportation, Wethersfield.

CONSTRUCTION OF A RECYCLED PORTLAND CEMENT CONCRETE PAVEMENT Construction Report, Oct. 1979 - May 1980

Keith R. Lane Sep. 1980 43 p refs

(HPR Proj. 646)

(PB81-233553; FHWA/CT-80/12; Rept-646-1-80-12) Avail: NTIS HC A03/MF A01 CSCL 13B

Connecticut's first experience with Portland cement concrete recycling is described. The test location was on I-84 in Waterbury, a major expressway which required extensive realignment and widening. The primary concern was to obtain the technical expertise to design and place a recycled pavement. Secondary factors also investigated were the analysis of environmental, economic and energy factors relative to the option

of recycling or new construction of a portland cement concrete pavement. GRA

N82-13268# Purdue Univ., Lafayette, Ind. School of Civil Engineering.
THE EFFECTS OF ADDED SOFTENING AGENTS UPON THE BEHAVIOR OF COLD RECYCLED ASPHALT MIXTURES
Akio Lida 1 Oct. 1980 471 p refs
(PB81-231417; JHRP-80-13; FHWA/IN/JHRP-80/13) Avail: NTIS HC A20/MF A01 CSCL 13C

The long-term behavior of recycled mixtures, especially when the recycling is done cold is reported. The long-term properties of laboratory specimens prepared with different softening agents were evaluated by means of a creep test. A design procedure for cold recycled mixtures is proposed which recommends that blending curves be developed and that a creep test be used to determine mixture properties over a period of time. GRA

N82-13269# Louisiana Dept. of Transportation and Development, Baton Rouge.
A LABORATORY EVALUATION OF MODIFIED ASPHALT Final Report, Nov. 1979 - Nov. 1980
Donald E. Carey and Harold R. Paul Jan. 1981 53 p Sponsored by the Federal Highway Administration, Washington, D.C.
(PB81-231615; LA-80-1B-B; FHWA/LA-81/142) Avail: NTIS HC A04/MF A01 CSCL 13C

The structural properties of sand mixes incorporating Chem-Crete binder compare favorably with densegraded asphaltic concrete. This binder, processed according to a new refinery technique, is purported to improve asphalt properties such as strength, durability, temperature susceptibility and water resistance. These attributes and other properties of sand/Chem-Crete mixes are examined. Generally, upon curing, sand mixes utilizing Chem-Crete binder demonstrate properties equal to or superior to Louisiana's dense-graded Type 1 asphaltic concrete (1200-lb. stability). GRA

N82-13270# Acurex Corp., Mountain View, Calif. Energy and Environmental Div.
PILOT-SCALE DEVELOPMENT OF A LOW-NOX COAL-FIRED TANGENTIAL SYSTEM Final Report, Sep. 1978 - Feb. 1981
J. T. Kelly, R. A. Brown, E. K. Chu, J. B. Wightman, R. L. Pam, E. L. Swenson, E. B. Merrick, and C. F. Busch Aug. 1981 239 p refs
(Contract EPA-68-02-1885)
(PB81-242513; EPA-600/7-81-137; IERL-RTP-1233) Avail: NTIS HC A11/MF A01 CSCL 13A

A 293 kWt (1 million Btu/hr) pilot scale facility is used to develop a low NOx pulverized coal fired tangential system. A burner concept is developed which achieves low NOx by directing the fuel and a fraction of the secondary combustion air into the center of the furnace, with the remaining secondary combustion air directed horizontally and parallel to the furnance walls. Such separation of secondary combustion air creates a fuel rich zone in the center of the furnace where NOx production is minimized. This combustion modification technique lowers NOx 64%, relative to conventional tangential firing, by injecting 85% of the secondary air along the furnace walls. Under these conditions, NO emissions are 180 ppm corrected to 0% 02. Also at these conditions, CO, UHC, and unburned carbon emissions are less than 40 ppm, 3 ppm, and 2.4%, respectively, comparable to conventional tangentially fired pilot scale results. GRA

N82-13271# Missouri Univ. -Rolla. Dept. of Civil Engineering.
OPTIMUM DESIGN OF STATIC, EARTHQUAKE, AND WIND STEEL STRUCTURES (ODSEWS-2D)
Franklin Y. Cheng, D. Srifuengfung, and L. H. Sheng Jan. 1981 314 p refs
(Grant NSF PFR-78-05694)
(PB81-232738; CIVIL-ENGINEERING-STUDY-81-10) Avail: NTIS HC A14/MF A01 CSCL 13M

A design technique is presented for trusses and braced and unbraced frames with consideration of various constraints of stresses, displacements, natural frequencies, member sizes, and upper- and lower-bounds of member stiffnesses. A computer program ODSEWS (Optimum Design of Static, Earthquake, and Wind Structures) was developed for which the dynamic input may be response spectra or code provisions. More than 80 cases were designed in which the frames were varied from one story to 30 stories for examining various response parameters. Among them the particular interests are in the effect of the interacting ground motions including P-Delta on the stiffness distribution at critical regions and at the entire system as well as in the assessment of structural systems and their serviceability. GRA

N82-13272# National Bureau of Standards, Washington, D.C. National Engineering Lab.
REVIEW OF FIRE TEST METHODS AND INCIDENT DATA FOR PORTABLE ELECTRIC CABLES IN UNDERGROUND COAL MINES Final Report
Emil Braun Jun. 1981 23 p refs
(PB81-227878; NBSIR-81-2292) Avail: NTIS HC A02/MF A01 CSCL 13L

Electrically powered underground coal mining machinery is connected to a load center or distribution box by electric cables. The connecting cables used on mobile machines are required to meet fire performance requirements defined in the Code of Federal Regulations. This report reviews Mine Safety and Health Administration's (MSHA) current test method and compares it to British practices. Incident data for fires caused by trailing cable failures and splice failures were also reviewed. It was found that the MSHA test method is more severe than the British but that neither evaluated grouped cable fire performance. The incident data indicated that the grouped configuration of cables on a reel accounted for a majority of the fires since 1970. GRA

N82-13273# Council for Scientific and Industrial Research, Pretoria (South Africa).
MINI-SEMINARS ON MACHINING TECHNOLOGY
L. Webster, P. H. H. Trendler, C. C. Shearer, P. N. Tomlinson, and A. T. Notter May 1980 96 p refs
(PB81-223034; ISBN-0-7988-1774-7) Avail: NTIS HC A05/MF A01 CSCL 13H

The development of the modern machine tool, optimizing machining conditions, grinding with amber boron nitride, the comparative performance of various cutting fluids, experience with the use of indexable tips, and selection and evaluation of cutting tools are discussed. GRA

N82-13274# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Structures and Materials Panel.
FATIGUE TEST METHODOLOGY
Oct. 1981 255 p refs Proc. of Lecture Series held at Lyngby, Denmark, 19-20 Oct. 1981; Lisbon, 22-23 Oct. 1981; Athens, 26-27 Oct. 1981
(AGARD-LS-118; ISBN-92-835-1401-7) Avail: NTIS HC A12/MF A01

Laboratory fatigue testing of small components and specimens is considered with the emphasis on: testing philosophies, hardware systems required to carry out these philosophies, and the associated test specimens. For individual titles, see N82-13275 through N82-13285.

N82-13275# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
THE ROLE OF FATIGUE TESTING **c39**
P. R. Edwards *In* AGARD Fatigue Test Methodology Oct. 1981 15 p refs (For primary document see N82-13274 04-31) Avail: NTIS HC A12/MF A01

Fatigue testing which involves proving and developing components, materials and processes, investigating particularly factors such as corrosion which can be damaging and those such as fatigue resistant fasteners which are beneficial to fatigue is discussed. Modern electrohydraulic machines and computers allow application of more representative loading conditions, tests to be monitored, and efficient data analyses. Use of standard loading sequences offers considerable benefits to fatigue programs. The monitoring of fatigue damage through the life since these techniques are very different between metals and composites is emphasized. Metals test techniques which determine cyclic

stresses and strains at points of fatigue initiation have led to considerable improvements in accuracy of life prediction. Author

N82-13276# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
PLANNING AND ANALYSIS OF A FATIGUE TEST PROGRAMME **c39**
D. Schuetz *In* AGARD Fatigue Test Methodology Oct. 1981 22 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

Advances in fatigue testing methods are presented. The increasing amount of service load data, the use of fracture mechanics, and the application of prediction methods which emphasize local stresses and/or strains are discussed. It is suggested that fatigue tests are still imperative in determining the fatigue performance of components or built up structures. Fatigue tests are the most important part of a fatigue life evaluation in spite of the current level of knowledge of fatigue mechanisms. E.A.K.

N82-13277# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Werkstoff-Forschung.
FATIGUE TEST MACHINES **c39**
H. Nowack *In* AGARD Fatigue Test Methodology Oct. 1981 23 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

Conventional and servohydraulic testing machines are reviewed. The main ranges in application of the systems are described. Servohydraulic resonance machines enable both, random tests and constant amplitude tests. For component and full scale tests of structures sophisticated test systems become necessary, which have to fulfill numerous specific requirements. The testing machines devices for the control, monitoring, and recording of the test parameters are described. It is concluded that online computers are a most efficient tool for the performance of fatigue tests. E.A.K.

N82-13278# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
VARIABLE AMPLITUDE FATIGUE TESTING **c39**
D. Schuetz *In* AGARD Fatigue Test Methodology Oct. 1981 31 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

The blocked program tests made possible through the introduction of a testing machine with a hybrid loading system consisting of a resonant type frequency device for blocks of loads with many cycles, and a hydraulic device for load blocks with a small number of cycles and single load cycles with differing amplitudes are discussed. It is pointed out that it is the introduction of electroservohydraulic closed loop testing machines which marked the first real breakthrough. The machines allow a component to be loaded in any load sequence at relatively high frequencies. Advancements are also made in the field of servohydraulics. Machines on which complicated load sequences can be applied are used for a large variety of variable amplitude loading sequences. E.A.K.

N82-13279# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Werkstoff-Forschung.
ON-LINE COMPUTERS IN FATIGUE TESTING **c39**
H. Nowack *In* AGARD Fatigue Test Methodology Oct. 1981 11 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

The introduction of online computer systems into fatigue testing are discussed. Different application schemes of computerized systems are described: dedicated systems, multiple purpose systems, and maximum flexibility systems. Essential viewpoints of the development of computerized systems are given. It is shown, that professional systems can offer significant advantages in many cases. Various aspects and examples for the practical work with computerized systems are given. E.A.K.

N82-13280# Bath Univ. (England). School of Materials Science.
FATIGUE TESTING OF FIBRE COMPOSITES **c24**
Bryan Harris *In* AGARD Fatigue Test Methodology Oct. 1981 18 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

The progress of fatigue in composites was monitored by most of the usual methods: the determination of S/N curves and master diagrams using constant stress or strain amplitude or random fluctuations, the determination of residual strength, and the observation of crack growth rates. The interpretation of these results and their translation to the design process demand consideration of the mode of failure, the definition of failure used in any given instance, and the relevance of the test procedure to practical applications. E.A.K.

N82-13281*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELEVATED TEMPERATURE FATIGUE TESTING OF METALS **c26**
Marvin H. Hirschberg *In* AGARD Fatigue Test Methodology Oct. 1981 18 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

Material characterization and evaluation conducted for the purpose of calculating fatigue crack initiation lives of components operating at elevated temperatures are discussed. The major technology areas needed to perform a life prediction of an aircraft turbine engine hot section component and the steps required for life prediction are outlined. These include: the determination of the operating environment, the calculation of the thermal and mechanical loading of the component, the cyclic stress strain and creep behavior of the material required for structural analysis, the structural analysis to determine the local stress strain temperature time response of the material at the critical location in the component, and from a knowledge of the fatigue, creep, and failure resistance of the material, a prediction of the life of the component. E.A.K.

N82-13282# Royal Aircraft Establishment, Farnborough (England). Materials Dept.
FATIGUE TESTS WITH A CORROSIVE ENVIRONMENT **c39**
R. N. Wilson *In* AGARD Fatigue Test Methodology Oct. 1981 20 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

The techniques used to study the fatigue behavior of metals and alloys in vacuum, gas and liquid environments are outlined. The methods used to simulate service conditions in the laboratory are described and the variables which must be considered when planning a corrosion fatigue test programme are discussed. An attempt to control or eliminate some of the experimental variables is illustrated. The fatigue performance of a fully protected 1.5 dog bone aluminium alloy test piece which is prestressed at low temperature and exposed to a corrosive environment prior to fatigue testing in salt fog is evaluated. E.A.K.

N82-13283# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
METHODS OF OBTAINING CRACK GROWTH DATA IN METALS **c26**
P. R. Edwards *In* AGARD Fatigue Test Methodology Oct. 1981 22 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

Methods of obtaining crack growth data in metals are subdivided into several groups. Crack length is determined by measuring compliance which changes as a crack grows. Compliance is measured across the faces of the crack with a clip gauge. Optical methods include surface crack length measurement techniques. With electrical methods a DC, pulsed DC or AC electric current is passed through the specimen and, across any crack, a potential drop is created indicating the crack size. Sonic methods include ultrasonics and acoustic emission, the former measuring crack length by interpreting reflected or transmitted ultrasonic beams and the latter obtaining an indication of crack rate by recording stress waves emitted as energy is released when the tip of the crack advances. Mechanical devices which fracture with the crack are used either as individual conductors bonded across the crack path or as a foil which changes in resistance as the crack grows through it. It is feasible to design specimens in which cracks occur in an area favorable for accurate or simple measurement. Fracture surface readback

is the only method which offers the possibility of determining crack rates on a specimen retrospectively after failure. E.A.K.

N82-13284# Bath Univ. (England). School of Materials Science.
MONITORING OF DAMAGE IN FIBRE COMPOSITES c24
Bryan Harris *In* AGARD Fatigue Test Methodology Oct. 1981 23 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

Various techniques were used to study the accumulation of damage in composite subjected to fatigue. Optical methods, x-radiography, ultrasonic techniques, thermal imaging, and acoustic emission analysis are all methods which are capable of revealing certain aspects of the development of damaged regions in a composite, but the usefulness of most of these is limited to certain types of material or specific structural situations. E.A.K.

N82-13285# Waterloo Univ. (Ontario). Dept. of Civil Engineering.
CYCLIC STRAIN APPROACH TO FATIGUE IN METALS c26
T. H. Topper and P. Au *In* AGARD Fatigue Test Methodology Oct. 1981 25 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

The progress of a crack from its initiation in a notch root through the notch stress field was simulated based on local notch root strains. Strains at the notch root or at the tip of the advancing crack are simulated or calculated and used to describe crack growth. These approaches are mainly applicable to blunt notches in which threshold stress continuously increases with crack length, while fracture mechanics approaches are adequate for sharp notches in which the maximum threshold stress occurs inside the material rather than at the surface. Methods of simulating cyclic plastic notch strains and the resulting crack advance and methods of simulating the effect of variable amplitude loading and biaxial stress states are described. E.A.K.

N82-13286 Duke Univ., Durham, N. C.
ANALYSIS AND BEHAVIOR OF STRUCTURES ON DISCRETE TENSIONLESS FOUNDATIONS Ph.D. Thesis
Mustafa Yousif Al-Mandil 1981 161 p
Avail: Univ. Microfilms Order No. 8124797

The behavior of a discrete tensionless foundation system is analyzed. Subsequently, seven general theorems regarding the nature of this class of problems are proven. Thirteen pure and mixed strategy algorithms are reviewed and their application to a typical illustrative problem is studied. Nonlinear boundary properties which give rise to multiple solutions are modelled, and a new algorithm is presented. The reliability of this algorithm in obtaining a second equilibrium configuration is discussed. The governing equations for the conventional foundations problem have a unique solution. Modifying the Newton-Raphson algorithm, adding adaptive updating, load stopping, and extrapolation leads to an excellent equation solving algorithm. When more than one solution exists, the reliability of the deflation technique for educing an alternate root for the system is improved by use of a new adaptive under-relaxation of a Newton-Raphson process. Dissert. Abstr.

N82-13287 Northwestern Univ., Evanston, Ill.
INJECTION AND DISTRIBUTION OF SILICATE GROUT IN SAND Ph.D. Thesis
Talat Abdul-Aziz Bader 1981 191 p
Avail: Univ. Microfilms Order No. 8124848

A laboratory model study to relate the effects of grout composition, silicate concentration, dilution, viscosity, temperature, and mechanical agitation to the actual pumping of the grout into the soil mass is described. Three experimental models, each with a different geometry, were studied: the basic difference between these models is the rate at which the grout front advances as the grout is injected at a constant flow rate. The magnitude and distribution of the pore fluid pressures developed during the grout injection process were measured, and the results indicate a very rapid decrease in pore fluid pressure with distance from the injection point. The strength and modulus of the grouted soil mass showed a tendency to decrease with distance from the injection point. Upon injection, the grout appears to flow progressively into the soil, with the fresher grout displacing the older grout toward the exterior of the grounded mass. There was no conclusive evidence of soil fracturing due to grout gelation in any of the tests. Dissert. Abstr.

N82-13288 Ohio State Univ., Columbus.
GEOMETRIC PROGRAMMING FOR ENGINEERING DESIGN OPTIMIZATION Ph.D. Thesis
Guri Singh Brar 1981 271 p
Avail: Univ. Microfilms Order No. 8121770

A computer program with the capabilities to handle generalized polynomial optimization problems was developed. Geometric programming theory for posynomial problems is used as the basis for this work. Signomial problems are converted to posynomial form through condensation. In the preparation of the program, features are built-in such that the user can control output by specifying input variables. An example is included to illustrate the step-by-step procedure for the use of this program. Several civil engineering optimization problems are formulated and solved using the algorithm GPALL. Practical suggestions are made to reduce the large size problems to a manageable size for an efficient solution. Convergence of the algorithm and its drawbacks are discussed. Dissert. Abstr.

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N82-13289 Ohio State Univ., Cleveland.
A DIGITAL TV SYSTEM FOR THE DETECTION OF HIGH SPEED HUMAN MOTION Ph.D. Thesis
Rong Chin Fang 1981 298 p
Avail: Univ. Microfilms Order No. 8121787

Two array cameras and a force plate were linked to a PDP-11/34 minicomputer for an on-line recording of high speed human motion. A microprocessor-based interface system was constructed to allow preprocessing and coordinating of the video data before being transferred to the minicomputer. Control programs of the interface system are stored in the disk and loaded into the program storage areas of the microprocessor before the interface system starts its operation. Software programs for collecting and processing video and force data have been written. Experiments on the detection of human jumping have been carried out. Normal gait and amputee gait have also been recorded and analyzed. Dissert. Abstr.

N82-13290 Purdue Univ., Lafayette, Ind.
DIGITAL VIDEO BANDWIDTH COMPRESSION SYSTEMS EMPLOYING BLOCK TRUNCATION CODING Ph.D. Thesis
Donald Joseph Healy 1981 134 p
Avail: Univ. Microfilms Order No. 8123650

A technique for bandwidth compression coding of sequential digitized video imagery is presented. The method uses adaptive one bit quantization over small blocks of space and time. The system includes global registration and motion detection for optimal bit assignments. A comparison is made with a conditional replenishment technique using a motion compensated predictor described in the literature. The method presented produces reconstructed video sequences filmed from low altitude aircraft with negligible degradation at 0.9 bit per pixel data rate. Robust behavior in the presence of channel noise is demonstrated. Dissert. Abstr.

N82-13291 Ohio State Univ., Cleveland.
HIGH FREQUENCY SCATTERING FROM MULTIPLE FINITE ELLIPTIC CYLINDERS Ph.D. Thesis
Eric Dale Greer 1981 196 p
Avail: Univ. Microfilms Order No. 8121795

The near and far zone radiation patterns of high frequency antennas in the presence of one or more finite length perfectly conducting elliptic cylinders was analyzed. The finite length

perfectly conducting elliptic cylinder can be used to model many curved surfaces found in shipboard, aircraft, and other complex electromagnetic environments. The near zone portion of this solution is useful for analyzing the coupling between antennas and for calculating radiation hazards in addition to verifying near field pattern measurements. The scattered fields of one or more elliptic cylinders are analyzed using the uniform geometrical theory of diffraction. The validity of this solution is shown by comparing the results with an exact modal solution, moment method solutions, and measured results. The examples studied indicate that this analysis will provide a useful solution within engineering accuracy to problems of practical interest to antenna designers. Dissert. Abstr.

N82-13292 Arizona State Univ., Tempe.
TWO-PATH MODEL OF FADING IN A HIGH DATA RATE COMMUNICATION CHANNEL Ph.D. Thesis
Pou-Tou Sun 1981 113 p
Avail: Univ. Microfilms Order No. 8124498

In order to simulate the properties of channel fading in high data rate communications, two new techniques have been devised to develop two new fading channel models. One method is a nondispersed fading channel model and the other is a dispersed fading channel model. The usefulness of these two models has been demonstrated and the effect of channel fading can be easily analyzed and understood at the input and output of the matched filter in the receiver. The difficulty in the simulation of channel fading, due to cross interference for Quadriphase-Shift Keying (QPSK) by the freqency domain analysis, is also solved by these models. The models have been applied to two commonly used communication systems, one being the Binary Phase-Shift Keying (BPSK) and the other being the Quadriphase-Shift Keying. The channel fading can be characterized and compared from the average probabilities of error of the system. The results show that the system performance of QPSK is more influenced by channel fading than BPSK. Dissert. Abstr.

N82-13293 Stanford Univ., Calif.
ENERGY SPECTRAL ANALYSIS IN PROJECTION RADIOGRAPHY Ph.D. Thesis
Bruno Strul 1981 97 p
Avail: Univ. Microfilms Order No. 8124163

Two topics related to the visualization of low contrast details in projection radiography are considered. The Compton scatter component in a given radiological study is quantitatively determined. Knowledge of the scatter fraction is important in the design of imaging systems and evaluation of their performance. A mathematical model for deriving the scatter fraction and the effectiveness of scatter reduction through separation of the object from the detector plane is presented. Experimental data are presented to substantiate the theoretical results. Second, a spatial frequency multiplexing method which enables recording of two images of an object, each at a different X-ray energy, on a single radiographic transparency is presented. This method is especially useful for K edge detection of low concentrations of iodinated contrast agents. Experimental results demonstrating the encoding and decoding techniques are presented. Dissert. Abstr.

N82-13294# Joint Publications Research Service, Arlington, Va. Foreign Technology Div.
ANTENNA (SELECTED ARTICLES)
8 Oct. 1981 22 p refs Transl. into ENGLISH from Antenny (USSR), no. 12, 1971 p 13-14, 65-76
(AD-A106476; FTD-ID(RS)T-0936-81) Avail: NTIS HC A02/MF A01 CSCL 20/14

The asymptotic solution of a problem of the diffraction of a plane wave is presented, and the design of wave splitters using dielectric waveguides is described. For individual titles, see N82-13295 through N82-13296.

N82-13295# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE USE OF THE KIRCHOFF METHOD FOR ASYMPTOTIC SOLUTION OF A PROBLEM OF THE DIFFRACTION OF A PLANE WAVE ON DIELECTRIC BODIES OF REVOLUTION
F. F. Izmaylov *In* AFSC Antenna (Selected Articles) (FTD-ID(RS)T-0936-81) 8 Oct. 1981 p 1-3 Transl. into ENGLISH from Antenny (USSR), no. 12, 1971 p 13-14, 65-76 (For primary document see N82-13294 04-32)
Avail: NTIS HC A02/MF A01 CSCL 20/14

Methods for computing a electromagnetic field vector after the passage of a plane wave through the dielectric walls of a surface of revolution are presented. An algorithm of geometric optics is given for a three dimensional problem, and the diffraction field component which emerges due to the acute nose of the cone is taken into account by means of the Kirchhoff method. The calculation results are compared to experimental data. Author

N82-13296# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COPHASED DIRECTED SURFACE WAVE SPLITTERS USING DIELECTRIC WAVEGUIDES
D. I. Mirovitskiy, V. F. Dubrovin, and V. V. Baskakov *In* AFSC Antenna (Selected Articles) (FTD-ID(RS)T-T-0936-81) 8 Oct. 1981 p 4-18 refs Transl. into ENGLISH from Antenny (USSR), no. 12, 1971 p 13-14, 65-76 (For primary document see N82-13294 04-32)
Avail: NTIS HC A02/MF A01 CSCL 20/14

Methods for constructing functional units for UHF and integral optics equipment using single mode and dielectric waveguides are presented. Four-armed and three-armed directed splitters constructed using rectangular polystyrene wave-guides according to symmetric and nonsymmetric designs are investigated. J.D.H.

N82-13297# Joint Publications Research Service, Arlington, Va. Foreign Technolgy Div.
ANTENNA (SELECTED ARTICLES)
16 Oct. 1981 28 p refs Transl. into ENGLISH from Antenny (USSR), no. 3, 1968 p 3-8, 142-155
(AD-A106522; FTD-ID(RS)T-0944-81) Avail: NTIS HC A03/MF A01 CSCL 20/14

Meter wavelength radio astronomy antennas and automatic measurement of antenna radiation patterns are described. For individual titles, see N82-13298 through N82-13299.

N82-13298# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RADIO ASTRONOMICAL ANTENNAS OF METER WAVELENGTHS
V. V. Vitkevich, Yu. P. Ilyasov, S. M. Kutuzov, and M. M. Tyaptin *In* AFSC Antenna (Selected Articles) (FTD-ID(RS)T-0944-81) 16 Oct. 1981 p 1-8 refs Transl. into ENGLISH from Antenny (USSR), no. 3, 1968 p 3-8, 142-155 (For primary document see N82-13297 04-32)
Avail: NTIS HC A03/MF A01 CSCL 20/14

A description of radioastronomic antennas operating simultaneously on waves of 3.5 m and 7 m is given. The effective area of one antenna is about 1000 sq m. Author

N82-13299# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHODS OF AUTOMATIC MEASUREMENT OF ANTENNA PARAMETERS
V. A. Torgovanov *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0944-81) 16 Oct. 1981 p 9-24 refs Transl. into ENGLISH from Antenny (USSR), no. 3, 1968 p 3-8, 142-155 (For primary document see N82-13297 04-32)
Avail: NTIS HC A03/MF A01 CSCL 20/14

The concept of generalized complex radiation patterns of antennas is introduced. A series of patterns is measured at different frequencies and polarizations. An automatic method for recording generalized antenna radiation patterns is proposed. J.D.H.

N82-13300*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MICROWAVE ATTENUATION AND BRIGHTNESS TEMPERATURE DUE TO THE GASEOUS ATMOSPHERE: A COMPARISON OF JPL AND CCIR VALUES
Ernest K. Smith and Joe W. Waters 15 Aug. 1981 55 p refs
(Contract NAS7-100)
(NASA-CR-165027; JPL-Pub-81-81) Avail: NTIS HC A04/MF A01 CSCL 20N

A sophisticated but flexible radiative transfer program designed to assure internal consistency was used to produce

brightness temperature (sky noise temperature in a given direction) and gaseous attenuation curves. The curves, derived from atmospheric models, were compared and a new set was derived for a specified frequency range. M.D.K.

N82-13301*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MODULATION/DEMODULATION TECHNIQUES FOR SATELLITE COMMUNICATIONS. PART 1: BACKGROUND
Jim K. Omura and Marvin K. Simon 15 Nov. 1981 111 p refs
(Contract NAS7-100)
(NASA-CR-165020; JPL-Pub-81-73) Avail: NTIS HC A06/MF A01 CSCL 17B

Basic characteristics of digital data transmission systems described include the physical communication links, the notion of bandwidth, FCC regulations, and performance measurements such as bit rates, bit error probabilities, throughputs, and delays. The error probability performance and spectral characteristics of various modulation/demodulation techniques commonly used or proposed for use in radio and satellite communication links are summarized. Forward error correction with block or convolutional codes is also discussed along with the important coding parameter, channel cutoff rate. A.R.H.

N82-13302*# Arinc Research Corp., Annapolis, Md.
THE 30/20 GHz COMMUNICATIONS SATELLITE TRUNKING NETWORK STUDY
William Kolb Oct. 1981 65 p
(Contract NAS3-22496)
(NASA-CR-165467) Avail: NTIS HC A04/MF A01 CSCL 17B

Alternative transmission media for a CONUS-wide trunking network in the years 1990 and 2000 are examined. The alternative technologies comprised fiber optic cable, conventional C- and Ku-band satellites, and 30/20 GHz satellites. Three levels of implementation were considered - a 10-city network, a 20-city network, and a 40-city network. The cities selected were the major metropolitan areas with the greatest communications demand. All intercity voice, data, and video traffic carried more than 40 miles was included in the analysis. In the optimized network, traffic transmitted less than 500 miles was found to be better served by fiber optic cable in 1990. By the year 2000, the crossover point would be down to 200 miles, assuming availability of 30/20 GHz satellites. Author

N82-13303# Defense Communications Engineering Center, Reston, Va.
FIBER OPTICS (OPTICAL WAVEGUIDES) TECHNOLOGY: POTENTIAL APPLICATION IN THE DCS
Harris A. Stover Feb. 1981 51 p
(AD-A104740; DCEC-TN-9-81) Avail: NTIS HC A04/MF A01 CSCL 17/2

This report is intended to introduce the reader to this new technology in sufficient detail to permit meaningful and reasonable consideration of potential applications in the DCS. Historical background is provided along with a brief discussion of the fundamental physics involved. A summary of the state-of-the-art in fiber optics cables is provided, which when considered along with related discussions of cable losses, light sources, light detectors, splices, connectors, and commercial applications of fiber optics should give the reader a good understanding of the present state of the fiber optics technology. A section is given on the properties of fiber optics that make them attractive for military communications. It will provide insight into functional and technical advantages of applying the technology in the DCS in addition to economic advantages of some applications. A brief section discusses current military fiber optics systems applicable to the DCS. The section on survivability of fiber optics communications introduces and discusses survivability of fiber optics communications, and indicates many possibilities where fiber optics might significantly enhance the survivability of the DCS. GRA

N82-13304# Joint Publications Research Service, Arlington, Va.
ANTENNA (SELECTED ARTICLES)
13 Oct. 1981 31 p refs Transl. into ENGLISH from Antenny (USSR), no. 5, 1969 p 82-107
(AD-A106523; ; FTD-ID(RS)T-0960-81) Avail: NTIS HC A03/MF A01 CSCL 20/14

The radiation pattern of arc antennas in a plane orthogonal to the plane of an arc is formulated. The formula is dependent on the radius of the arc and amplitude distribution in the orthogonal plane. The efficiency and output coefficient of power, directive gain, and gain factor of a linear periodic array are investigated. For individual titles, see N82-13305 through N82-13306.

N82-13305# Joint Publications Research Service, Arlington, Va.
THE FORMATION OF RADIATION PATTERNS OF ARC ANTENNAS
V. M. Golovachev and A. A. Kuzmin *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0960-81) 13 Oct. 1981 p 1-13 refs Transl. into ENGLISH from Antenny (USSR), no. 5, 1969 (For primary document see N82-13304 04-32)
Avail: NTIS HC A03/MF A01 CSCL 20/14

The radiation pattern of arc antennas in a plane orthogonal to the plane of an arc is formulated. The formula of the radiation pattern depends on the radius of the arc and amplitude distribution in the orthogonal plane. Characteristics of the forming of the radiation pattern of an arc antenna in a plane normal to the plane of an arc are examined. S.L.

N82-13306# Joint Publications Research Service, Arlington, Va.
ENERGY CHARACTERISTICS OF PERIODIC SYSTEMS OF RADIATORS: EFFICIENCY AND OUTPUT COEFFICIENT OF POWER, DIRECTIVE GAIN, AND GAIN FACTOR
I. V. Guzeyev and A. B. Kolot *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0960-81) 13 Oct. 1981 p 14-27 refs Transl. into ENGLISH from Antenny (USSR), no. 5, 1969 (For primary document see N82-13304 04-32)
Avail: NTIS HC A03/MF A01 CSCL 20/14

The efficiency and output of power directive gain, and gain factor of a linear periodic array are investigated. The matrix of scattering and partial gain of the array element is established. S.L.

N82-13307# Joint Publications Research Service, Arlington, Va.
ANTENNA (SELECTED ARTICLES)
15 Oct. 1981 99 p refs Transl. into ENGLISH from Antenny (USSR), no. 7, 1979 p 1-50
(AD-B060598; FTD-ID(RS)T-0820-81; FTD-81-C-000943)
Avail: NTIS HC A05/MF A01 CSCL 20/14

Results of experimental studies on two-mirror antenna systems for radio relay communication are summarized. The system, having displaced focal axis and high electrical parameters, can also be applied to space communication. The following antenna system parameters are discussed; structural design criteria; system schematics; equipment specifications for the parabolic and horn antennas; economic considerations; mathematical methods for describing antenna radiation patterns and solving problems of discrete emitters in radiating systems; amplification, polarization, displacement, and reflection factors. For individual titles, see N82-13308 through N82-13310.

N82-13308# Joint Publications Research Service, Arlington, Va.
TWO-MIRROR ANTENNA FOR RADIO RELAY COMMUNICATION
Yu. A. Yerukhimovich, S. N. Zimin, and A. A. Metrikin *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0820-81) 15 Oct. 1981 p 2-39 refs Transl. into ENGLISH from Antenny (USSR), no. 7, 1970 p 3-21 (For primary document see N82-13307 04-32)
Avail: NTIS HC A05/MF A01 CSCL 20/14

The following design specifications and operational considerations for a two-mirror antenna radio relay system, having a displaced focal axis, are discussed: amplification, polarization, frequency, and reflection of radio waves; economic factors in design/construction of horn and parabolic antennas and their components; system's schematics; and, sidelobe parameters. Specifics of the phase center, focal ring, and mirror edge

configurations are detailed. System's advantages/disadvantages are also presented. M.D.K.

N82-13309# Joint Publications Research Service, Arlington, Va.

USE OF PRINCIPLE OF REGULARIZATION IN DIRECT AND MIXED PROBLEMS OF THE THEORY OF THE SYNTHESIS OF RADIATING SYSTEMS

L. D. Bakhras, S. D. Kremenetskiy, and M. Ye. Zhukovima *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0820-81) 15 Oct. 1981 p 40-75 refs Transl. into ENGLISH from Antenny (USSR), no. 7, 1970 p 22-40 (For primary document see N82-13307 04-32)

Avail: NTIS HC A05/MF A01 CSCL 20/14

Methods of regularization and quasi-solutions theory are applied in solving problems related to synthesis of radiating systems. Mathematical methods for and computer applications in describing antenna radiation patterns and parameters of wave amplification, displacement, energy distribution, and frequency are outlined. M.D.K.

N82-13310# Joint Publications Research Service, Arlington, Va.

SYNTHESIS OF A PLANE SYSTEM OF DISCRETE EMITTERS

S. D. Kremenetskiy *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0820-81) 15 Oct. 1981 p 76-95 refs Transl. into ENGLISH from Antenny (USSR), no. 7, 1970 p 41-50 (For primary document see N82-13307 04-32)

Avail: NTIS HC A05/MF A01 CSCL 20/14

Mathematical methods for describing antenna radiation patterns and solving problems of digital emitters in radiating systems are presented. The following methods were utilized: Fourier transformations; orthonormal and linear functions; vector analysis; quadratures; and Jacobi matrix methods. M.D.K.

N82-13311# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ANTENNA (SELECTED ARTICLES)

15 Oct. 1981 164 p refs Transl. into ENGLISH from Antenny (USSR), no. 5, 1969 p 20-34, 47-60, 108-162 (AD-A106474; FTD-ID(RS)T-0821-81) Avail: NTIS HC A08/MF A01 CSCL 20/14

A collection of selected articles on telecommunication with emphasis on antennas is presented. The following topics are discussed: (1) radiation aperture superdirectionality properties; (2) antenna synthesis by optical systems; (3) thin magnetic impedance antennas; (4) open resonators; (5) complex waveguide junctions; and (6) shot wave receiving antennas. For individual titles, see N82-13312 through N82-13317.

N82-13312# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SOME PROPERTIES OF THE RADIATING APERTURE SUPERDIRECTIONALITY

L. A. Vengrovich *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0821-81) 15 Oct. 1981 p 1-27 refs Transl. into ENGLISH from Antenny (USSR), no. 5, 1969 p 20-34 (For primary document see N82-13311 04-32)

Avail: NTIS HC A08/MF A01 CSCL 20/14

Radiating aperture superdirectionality, to assess the physical limitations of radiation was studied. An integral equation which connects the excitable in the aperture electric field with the transverse component of the magnetic field is derived. Solution of the integral equation and introduction of equivalent outlines allows computation of the total power flux through the slot and the energy accumulated in its vicinity. E.A.K.

N82-13313# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SOLUTION OF THE PROBLEM OF THE SYNTHESIS OF ANTENNAS WITH THE AID OF A COHERENT OPTICAL SYSTEM

L. D. Bakhrakh, Yu. A. Kolosov, A. P. Kurochkin, and V. I. Troitskiy *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0821-81) 15 Oct. 1981 p 28-56 refs Transl. into ENGLISH from Antenny (USSR), no. 5, 1969 p 47-60 (For primary document see N82-13311 04-32)

Avail: NTIS HC A08/MF A01 CSCL 20/14

The synthesis of plane aperture with the use of a coherent optical system was studied. Optical simulation methods of antennas in by synthesis and the special features/peculiarities of the recording of the transparencies which imitate the preset composite radiation patterns are examined. A diagram of optical installation for the synthesis of antennas with the plane aperture and the results of the synthesis of some radiation patterns is provided. E.A.K.

N82-13314# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THIN MAGNETIC IMPEDANCE ANTENNAS

E. A. Glushkovskiy, B. M. Levin, and Ye. Ya. Rabinovich *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0821-81) 15 Oct. 1981 p 57-80 refs Transl. into ENGLISH from Antenny (USSR), no. 5, 1969 p 108-120 (For primary document see N82-13311 04-32)

Avail: NTIS HC A08/MF A01 CSCL 20/14

Application of impedance boundary conditions to the solution of excitation of thin magnetic radiators was investigated. The thin ferrite of the finite length, excited by the framework, and the narrow slot, gashed in the conducting cylinder is discussed. E.A.K.

N82-13315# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

OPEN RESONATORS, FORMED BY CONFOCAL MIRRORS WITH THE VARIABLE REFLECTION COEFFICIENT AND THE GENERALIZED HYPER-SPHEROIDAL FUNCTIONS

N. S. Kosmodamianskaya and V. F. Los *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0821-81) 15 Oct. 1981 p 81-111 refs Transl. into ENGLISH from Antenny (USSR), no. 5, 1969 p 121-139 (For primary document see N82-13311 04-32)

Avail: NTIS HC A08/MF A01 CSCL 20/14

The characteristics of a confocal resonator with rectangular and circular mirrors from which transparency is changed by the specific law were examined. It is shown that for the mirrors with the ideal reflection the problem is reduced to the examination of a differential equation in which the solution is expressed as the generalized hyperspheroidal function. The asymptotic representations of this function is obtained and the results of the calculations are given. E.A.K.

N82-13316# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

METHOD OF THE STUDY OF COMPLEX WAVEGUIDE JUNCTIONS WITH ONE OR SEVERAL REGIONS OF COMMUNICATION

S. V. Butakova *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0821-81) 15 Oct. 1981 p 112-142 refs Transl. into ENGLISH from Antenny (USSR), no. 5, 1969 p 140-154 (For primary document see N82-13311 04-32)

Avail: NTIS HC A08/MF A01 CSCL 20/14

Complex waveguide junctions with several regions of communication were studied. The formula of the scattering matrix of the connections of regular waveguides with the heterogeneities, which calculate different plumbings by using a computer is obtained. Formulas of the scattering matrices of several devices SVCH in rectangular waveguide with H sub MO waves are presented. E.A.K.

N82-13317# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THREE-STAGE COMMUTATION FIELD OF THE SYSTEM OF THE REPEATED USE OF SHORT-WAVE RECEIVING ANTENNAS

V. D. Chelyshev *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0821-81) 15 Oct. 1981 p 143-160 refs Transl. into ENGLISH from Antenny (USSR), no. 5, 1969 p 154-162 (For primary document see N82-13311 04-32)

Avail: NTIS HC A08/MF A01 CSCL 20/14

Three stage commutation systems were examined. The special features which ensue from the admissibility of simultaneous connection to one antenna of the group of receivers are considered. The fundamental characteristics of three to stage commutation fields are given in the comparison with the single stage field of the same capacity. E.A.K.

N82-13318# Joint Publications Research Service, Arlington, Va. Foreign Technology Div.
ANTENNA (SELECTED ARTICLES)
19 Oct. 1981 98 p refs Transl. into ENGLISH from Antenny (USSR), no. 2, 1967 p 4-32, 55-70, 117-130, and 166-178 (AD-B060573; FTD-ID(RS)T-0937-81) Avail: NTIS HC A05/MF A01 CSCL 20/14

Television antenna technology, image discrimination, antenna radiation patterns, and antenna phase correction are discussed. For individual titles, see N82-13319 through N82-13322.

N82-13319# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE DEVELOPMENT OF DOMESTIC TECHNOLOGY FOR TELEVISION TRANSMITTING ANTENNAS
D. M. Truskanov *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0937-81) 19 Oct. 1981 p 1-37 refs Transl. into ENGLISH from Antenny (USSR), no. 2, 1967 p 4-32 (For primary document see N82-13318 04-32)
Avail: NTIS HC A05/MF A01 CSCL 20/14

The history of the development of Russian technology for television transmission antennas and the current state of the art are reviewed. The principles of construction of antenna feed circuits are described. Multiprogram antenna systems mounted on masts 235 and 350 m high, a 316 m high tower antenna system in Leningrad, and the 533 m high Ostankino tower antenna in Moscow are described. J.D.H.

N82-13320# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DISCRIMINATION OF HOLOGRAM AND ANTENNA THEORY
A. A. Pistolkors *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0937-81) 19 Oct. 1981 p 38-57 refs Transl. into ENGLISH for Antenny (USSR), no. 2, 1967 p 55-70 (For primary document see N82-13318 04-32)
Avail: NTIS HC A05/MF A01 CSCL 20/14

A theoretical examination of image discrimination of the hologram during image reproduction is presented. A two dimensional electrodynamic problem is examined. With the use of planar and cylindrical reference flows, conditions for the correct reproduction of the image of a luminous line are established. The discrimination of the hologram in the direction parallel to its plane is investigated. A similarity is noted between the obtained expression and the integral equation of a linear antenna, making possible utilization of the theory of the directional effect of antennas in determining the solution. It is shown that the maximum resolution in the plane parallel to the hologram is equal to the wave length. Discrimination in the direction perpendicular to the plane is much worse than in the parallel. J.D.H.

N82-13321# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RADIATION OF AN ANTENNA IN THE FORM OF A RIBBED SHAFT OF FINITE LENGTH
G. D. Malushkov *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0937-81) 19 Oct. 1981 p 58-74 refs Transl. into ENGLISH from Antenny (USSR), no. 2, 1967 p 117-130 (For primary document see N82-13318 04-32)
Avail: NTIS HC A05/MF A01 CSCL 20/14

The method of integral equations of the first order is used to solve the problem of excitation of an impedance cylinder of finite length by a short symmetrical electrical dipole with sinusoidal distribution of the outside current. The dipole is located on the axis of rotation of the cylinder, and is perpendicular to it. Also given are the procedure and some results of calculation of the current distributions on the surface of the impedance cylinder, and the beam patterns for constant and variable (linearly-increasing) impedances. The calculated and experimental beam patterns are analyzed as a function of the length, the radius of the cylinder and the magnitude of the surface impedance.
Author

N82-13322# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
POSSIBILITIES OF PHASE CORRECTION ON THE SMALL REFLECTOR IN A TWO-REFLECTOR ANTENNA
A. L. Ayzenberg *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0937-81) 19 Oct. 1981 p 75-91 refs Transl. into ENGLISH from Antenny (USSR), no. 2, 1967 p 166-178 (For primary document see N82-13318 04-32)
Avail: NTIS HC A05/MF A01 CSCL 20/14

The effect of redistribution of energy in a two-reflector system on the directive gain and noise temperature of the antenna is analyzed. Phase errors are compensated for by flexures of the basic (large) reflector, through automatic correction of the shape of the auxiliary (small) reflector. The calculations determine the maximum permissible deformations of the reflectors possible with given impairments of the antenna characteristics. J.D.H.

N82-13323# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ANTENNA (SELECTED ARTICLES)
16 Oct. 1981 64 p refs Transl. into ENGLISH from Antenny (USSR), no. 9, 1970 p 53-80
(AD-A106499; FTD-ID(RS)T-0822-81) Avail: NTIS HC A04/MF A01 CSCL 20/14

Irregular quasi-optical lines (beam guides) are statistically analyzed using computerized simulation. The statistical theory of antennas is used to determine the statistical characteristics of the 'noise' of transparent dielectric films. Frequency dividers for metal dielectric waveguides with high electrical characteristics in the broadband are developed. For individual titles, see N82-13324 through N82-13326.

N82-13324# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A STATISTICAL ANALYSIS OF IRREGULAR QUASI-OPTICAL LINES (BEAM GUIDES) WITH THE AID OF COMPUTER(S)
In its Antenna (Selected Articles) (FTD-ID(RS)T-0822-81) 16 Oct. 1981 p 1-20 refs Transl. into ENGLISH from Antenny (USSR), no. 9, 1970 p 53-61 (For primary document see N82-13323 04-32)
Avail: NTIS HC A04/MF A01 CSCL 20/14

Irregular quasi-optical lines (beam guides) are statistically analyzed using computerized simulation. The qualitative difference between the multimode and one mode beam guides is developed. Beam guides with different means of heterogeneities are investigated. S.L.

N82-13325# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ONE USE OF METHODS OF THE STATISTICAL THEORY OF ANTENNAS
G. S. Bogoslovskiy and V. A. Usin *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0822-81) 16 Oct. 1981 p 21-39 refs Transl. into ENGLISH from Antenny (USSR), no. 9, 1970 p 62-71 (For primary document see N82-13323 04-32)
Avail: NTIS HC A04/MF A01 CSCL 20/14

Methods and apparatus for the statistical theory of antennas are used for determining the statistical characteristics of the 'noise' of transparent dielectric films. Film frequently characterized by dispersion and by a radius of the correlation of distortions is considered, as is the quantitative evaluation of the degree of the distortion of information. S.L.

N82-13326# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DIRECTED DIVIDERS ON THE METAL-DIELECTRIC WAVEGUIDES
V. F. Dubrovin, D. I. Mirovitskiy, and L. S. Osipov *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0822-81) 16 Oct. 1981 p 40-60 refs Transl. into ENGLISH from Antenny (USSR), no. 9, 1970 p 72-80 (For primary document see N82-13323 04-32)
Avail: NTIS HC A04/MF A01 CSCL 20/14

Structurally simple waveguide frequency dividers of metal dielectrics were developed based on the principle of beam communication to ensure high electrical characteristics in the breadband. The dividers were fabricated in series using methods of printed technology. Electrical and structural characteristics are given for a two channel centimeter wave guide frequency divider. S.L.

N82-13327# Joint Publications Research Service, Arlington, Va.

ANTENNA (SELECTED ARTICLES)

16 Oct. 1981 126 p refs Transl. into ENGLISH from Antenny (USSR), no. 11, 1971 p 1-59

(AD-A106500; FTD-ID(RS)T-0826-81) Avail: NTIS HC A07/MF A01 CSCL 20/14

The electromagnetic characteristics of various antenna configurations are investigated. Particular emphasis is given to slot antenna and antenna array designs. For individual titles, see N82-13328 through N82-13332.

N82-13328# Joint Publications Research Service, Arlington, Va.

EXCITATION OF RADIAL RESONATOR WITH ANNULAR SLOT

V. A. Poperechenko *In its* Antenna (Selected Articles) (FTD-ID(RS) T-0826-81) 16 Oct. 1981 p 2-24 refs Transl. into ENGLISH from Antenny (USSR), no. 11, 1971 p 3-14 (For primary document see N82-13327 04-32)

Avail: NTIS HC A07/MF A01 CSCL 20/14

The problem of the external and internal excitation of a radial resonator with a narrow annular slot, which radiates into a half space is considered. A question is raised about the completeness of a set of functions which describe the fields within the resonator during the excitation only by its alternating outside currents. A method of addition and integration of poorly converging series and integrals is applied. A technique for the strict solution of the electrodynamic problem is presented along with calculations of the fundamental parameters of the antenna: the distribution of voltage along the slot, the radiation pattern, polarizational characteristic, composite conductivity of the radiation, and input resistance. M.G.

N82-13329# Joint Publications Research Service, Arlington, Va.

SYNTHESIS OF NONEQUIDISTANT LINE-SOURCE ANTENNA BY THE STATISTICAL METHODS OF SEARCH

O. I. Levin *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0826-81) 16 Oct. 1981 p 25-51 refs Transl. into ENGLISH from Antenny (USSR), no. 11, 1971 p 15-26 (For primary document see N82-13327 04-32)

Avail: NTIS HC A07/MF A01 CSCL 20/14

The application of statistical optimization methods to the task of synthesizing nonequidistant rarefied gratings is examined. The task is comprised of stochastic system differential equations, the point of stable equilibrium of which is the point of the location of the unknown extremum of the functional of the mismatch of preset and synthesized diagrams. The results of the calculations of nonequidistant antenna arrays by the method are given. M.G.

N82-13330# Joint Publications Research Service, Arlington, Va.

PRINCIPLES OF THE CONSTRUCTION OF SYSTEMS, WHICH POSSESS POTENTIAL FREQUENCY INDEPENDENCE

B. I. Molodov *In* is Antenna (Selected Articles) (FTD-ID(RS)T-0826-81) 16 Oct. 1981 p 52-88 refs Transl. into ENGLISH from Antenny (USSR), no. 11, 1971 p 27-42 (For primary document see N82-13327 04-32)

Avail: NTIS HC A07/MF A01 CSCL 20/14

The development of design models for the construction of antennas with weak frequency dependence is discussed and related to broadband and super broadband equipment. The conditions for the similarity of fields are obtained from the Maxwell equations (which contain outside currents) by the methods of similitude theory. On the basis of these conditions, the general principles for the construction of systems which possess potential frequency independence are formulated. M.G.

N82-13331# Joint Publications Research Service, Arlington, Va.

NATURAL AND MUTUAL CONDUCTIVITIES OF HALF-WAVE SLOTS, ARBITRARILY ORIENTED ON THE CONDUCTING SURFACE OF CIRCULAR CYLINDER

I. F. Dobrovolskiy, V. M. Klyuyev, and A. I. Rogachev *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0826-81) 16 Oct. 1981 p 89-102 refs Transl. into ENGLISH from Antenny (USSR), no. 11, 1971 p 43-50 (For primary document see N82-13327 04-32)

Avail: NTIS HC A07/MF A01 CSCL 20/14

The asymptotic expression of an improper integral, giving tangential components of the field on the surface of an ideally conducting cylinder excited by magnetic current is found on the base of the representation of the functions of Hankel with Airy's functions. The obtained analytical expressions are applied for the calculation of natural and mutual conductivities of the arbitrarily oriented half-wave slots on a cylinder of comparatively large radius (ka > 10). The results of numerical calculations are given for different orientations of slots. M.G.

N82-13332# Joint Publications Research Service, Arlington, Va.

CHARACTERISTICS OF ANTENNAS WITH FREQUENCY BEAM SWINGING

D. B. Aimin and Y. S. Losev *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0826-81) 16 Oct. 1981 p 103-122 refs Transl. into ENGLISH from Antenny (USSR), no. 11, 1971 p 50-59 (For primary document see N82-13327 04-32)

Avail: NTIS HC A07/MF A01 CSCL 20/14

The characteristics of line-source antennas with frequency beam swinging, intended for the use in the flat antennas with wide-angle beam swinging in two planes, are determined. It is claimed that for obtaining the high electrical characteristics in the flat plane antenna arrays it is expedient to utilize the line-source antennas, constructed on the base of waveguide kite circuits with the waveguide bends in the plane of the magnetic field. M.G.

N82-13333# Naval Postgraduate School, Monterey, Calif.

THE MESSAGE PROCESSING AND DISTRIBUTION SYSTEM DEVELOPMENT M.S. Thesis

Kenneth Lee Whitten Jun. 1981 55 p refs

(AD-A104585) Avail: NTIS HC A04/MF A01 CSCL 17/2

A historical approach is used in presenting the life cycle development of the Navy's message processing and distribution system beginning with the planning phase and ending with the integrated logistic support phase. Several maintenance problems which occurred after the system was accepted for fleet use were examined to determine if they resulted from errors in the acquisition process. The critical decision points of the acquisition process are examined and constructive recommendations are made for avoiding the problems which hindered the successful development of this system. Author

N82-13334# Varian Associates, Palo Alto, Calif.

THREE-5 HETEROSTRUCTURE AVALANCHE PHOTODIODE MODULES FOR FIBER OPTIC COMMUNICATION LINKS IN THE 1.0 TO 1.3 MICROMETER SPECTRAL RANGE Final Report, Feb. 1978 - May 1980

R. Yeats and K. VonDessonneck Fort Monmouth, N.J. Army Communications Research and Development Command 1 Jan. 1981 69 p refs

(Contract DAAB07-78-C-2402; DA Proj. 1L1-62701-AH-92) (AD-A099506; CORADCOM-78-2402-F) Avail: NTIS HC A04/MF A01 CSCL 17/2

Hybrid-structure InP-InGaAsP APDs have been fabricated which have negligible dark current I sub D < (6 nA at M = 30). The excess noise factor, F, for a hole initiated avalanche, has been determined to be F/M = 0.42 plus or minus 0.10 for 5 < or = M < or = 35. Conventional-structure high-bandgap (1.27 eV) InGaAsP APDs have been fabricated. These resemble low-leakage InP APDs rather than the high-leakage low-bandgap (1.00 eV) InGaAsP APDs. Low-noise bipolar transimpedance preamps have been designed and fabricated. These have bandwidths out to 500 MHz (for R sub f = 1 K Omega). The sensitivity of the best hybrid APDs used with these preamps is estimated to be - 46.6 dBm for a 100 Mbit/set, 10 to the minus 9th power bit error rate system, operating at a wavelength of 1.1 microns. Author

N82-13335# Air Force Geophysics Lab., Hanscom AFB, Mass.

JOINT AGENCY DOPPLER TECHNOLOGY TESTS Scientific Final Report

Ralph J. Donaldson, Jr. and Kenneth M. Glover 21 Nov. 1980

33 p refs
(AF Proj. 6670)
(AD-A100208; AFGL-TR-80-0357; AFGL-ERP-720) Avail: NTIS HC A03/MF A01 CSCL 17/9

Doppler weather radar technology is evaluated. The decisive superiority of Doppler techniques for reliable identification and early warning of tornadoes and other severe thunderstorm hazards was demonstrated. The format and effectiveness of manually aided automatic display products transmitted in near-real time to operational agencies remotely located from the radar were evaluated. Author

N82-13336# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.

SURFACE-PATCH TECHNIQUES FOR MODELING THREE-DIMENSIONAL RADIATING OR SCATTERING OBJECTS Final Technical Report, 15 Sep. 1978 - 15 Sep. 1980

Johnson J. H. Wang Griffiss AFB, N.Y. RADC Apr. 1981 76 p refs
(Contract F19628-78-C-0224; AF Proj. 2305)
(AD-A100212; RADC-TR-81-41) Avail: NTIS HC A03/MF A01 CSCL 20/3

A theoretical study of the surface patch technique for solving the electromagnetic fields of three-dimensional scattering and radiating geometries was conducted. Improved techniques for the numerical calculations were also developed. In particular, the Georgia Tech surface-patch algorithm was improved and tested for conducting prolate spheroids, circular and rectangular cylinders, and cubes. The numerical results were good even for the finite cyclinders with sharp edges. An electric field integral equation algorithm was also developed and tested satisfactorily on thin plate scattering problems. The merits of the triangular surface-patch for solving the general three-dimensional electromagnetic problems have thus been demonstrated. Author

N82-13337# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.

FLOW CONTROL AND ROUTING IN AN INTEGRATED VOICE AND DATA COMMUNICATION NETWORK Ph.D. Thesis

Oliver Chukwudi Ibe Aug. 1981 118 p refs
(Contract N00014-75-C-1183; ARPA Order 3045)
(AD-A103342; LIDS-TH-1115) Avail: NTIS HC A06/MF A01 CSCL 17/2

A model of an integrated voice and data network, lending itself to analytic and algorithmic solution, and formulated as a convex optimization problem is considered. The model can be generalized to solve problems of networks which handle n types of traffic that have different levels of delay, sensitivity, where $n < 2$. A joint flow control and routing algorithm is constructed which uses short term average information on the network utilization to set the voice packet lengths and data input rates, and to determine the routes for each conversation. The voice packet lengths and data input rates are set in such a way as to achieve an optimal tradeoff between each user's satisfaction and the cost of network congestion. Additional protocols are specified for dealing with such issues as congestion avoidance and control, and for implementing flow control on a dynamic basis. Author

N82-13338# Army Electronic Proving Ground, Fort Huachuca, Ariz.

STANDARD BIT ERROR RATE (BER) VERSUS RECEIVED SIGNAL LEVEL TESTING Final Report

1 Sep. 1981 15 p refs
(AD-A104573; TOP-6-2-570) Avail: NTIS HC A02/MF A01 CSCL 17/2

Bit error rate (BER) bench testing of digital radios in a back-to-back mode determines hardware characteristics independent of external anomalies such as impulse noise, fading, and interfering signals. This method employs the statistic of a characteristic theoretical curve of a long term BER versus received signal level (RSL). The attenuation is initially set to produce a BER of approximately .0001 at a corresponding RSL. When this point on the curve is statistically valid long term BERs can be predicted to correspond with the RSL. Author

N82-13339# Harris Corp., Melbourne, Fla. Government Communications Systems Div.

MILLIMETER WAVE ALTERNATE ROUTE STUDY Final Technical Report, 18 Dec. 1978 - 18 Feb. 1980

W. C. Adams, J. J. Pan, W. C. Whitehead, E. T. Horton, Jr., J. W. Reid, and G. P. Martin Griffiss AFB, N.Y. RADC Apr. 1981 380 p refs
(Contract F30602-79-C-0055; AF Proj. 4519)
(AD-A102303; RADC-TR-81-42) Avail: NTIS HC A17/MF A01 CSCL 17/2

Millimeter wave applications and millimeter component technology is assessed for both tactical and strategic applications. Antijam techniques and multiple path diversity for improving reliability are investigated. A detailed hardware and propagation analysis to determine the millimeter bands which most effectively satisfy system requirements from a cost/implementation and system availability tradeoff point of view is conducted for various potential applications. GRA

N82-13340# Ohio State Univ., Columbus. Dept. of Electrical Engineering.

A HYBRID METHOD WHICH COMBINES A MOMENT METHOD CURRENT WITH AN ASYMPTOTIC CURRENT Interim Report

T. J. Kim and G. A. Thiele Griffiss AFB, New York RADC May 1981 150 p refs
(Contract F19628-78-C-0198)
(AD-A102199; RADC-TR-81-91; ESL-7113553-2) Avail: NTIS HC A07/MF A01 CSCL 20/14

A technique is considered for combining a moment method current and an asymptotic current in both two and three dimensions. No a priori knowledge of the current form away from the moment method region is needed nor is there need to follow ray paths on the surface of a conductor as in the geometric theory of diffraction method. A.R.H.

N82-13341# Bundesministerium der Verteidigung, Bonn (West Germany).

EXPERIMENTAL AND THEORETICAL INVESTIGATIONS WITH LABORATORY MODELS OF PHASED ARRAY ANTENNA

H. Lueg 1979 70 p refs In GERMAN; ENGLISH summary (BMVg-FBWT-79-21) Avail: NTIS HC A04/MF A01; DOK-ZENTBw, Bonn DM 30

Phased arrays in the X band frequency range are studied. A theory is introduced, leading to the calculation of a conformal array of waveguide-fed aperture antennas. To test the theory, an antenna model was constructed. Printed antennas were considered for array application. Simple resonant, microstrip antennas were investigated. Theory and measurement agree. Dynamic theory leads to improvement in the design of mutually coupled active modules. Beam scanning of an active spherical antenna array was examined with respect to these results. An antenna array was set up with eight active elements and tested under computer control. For application of pulsed active modules in phased array antennas, measurement and compensation of frequency chirp are demonstrated feasible. Author (ESA)

N82-13342# AEG-Telefunken, Backnang (West Germany). Fachbereich Raumfahrt.

INVESTIGATION OF MODULATION METHODS AND SYSTEM ASPECTS FOR REGENERATIVE SATELLITE-REPEATER Final Report

Sander Rasmussen, Werner Schreitmueller, and Rudolf Wrzesinsky Bonn Bundesministerium fuer Forschung und Technologie Sep. 1980 115 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-80-024; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 24.20

Various modulation methods are compared by means of a simulation program for carrier recovery circuits. This program incorporates Q phase shift keying with offset, real carrier and clock recovery systems, adjacent channel interference, and multipath effects. Applications are given for quadrature amplitude modulation systems envisaged for satellites, Q phase shift keying with and without offset, and coherent modulation and demodulation of frequency shift keying. Regenerative repeaters for satellite communication are shown to present many advantages and a special solution is proposed for effective control of fading

on the downlink and the uplink of a satellite system. A fundamental concept of a regenerative satellite repeater is defined, allowing system variants to be chosen in function of the number and size of the ground stations. Author (ESA)

N82-13343# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
ENVIRONMENT SIMULATOR FOR RADAR SIGNALS ON THE DIGITAL LEVEL [RADARSIGNALMILJOESIMULATOR PAA DIGITAL NIVAA]
Bo Karlsson Mar. 1981 100 p refs In SWEDISH
(FOA-A-30025-E4) Avail: NTIS HC A05/MF A01

Environment simulation of radar signals on the HF and video level is generally done with digitally driven analog generators. For simulation on the digital level, the same analog generators may be used with analog to digital conversion of output signals. Theoretically a diversion is implied when only the digital output signal is desired. A test simulating device on the digital level is described with the aid of multiprocessing techniques and without the use of analog generators.
Author (ESA)

N82-13344 Northwestern Univ., Evanston, Ill.
SHORT-RANGE COMMUNICATIONS USING DIFFUSELY SCATTERED INFRARED RADIATION Ph.D. Thesis
Michael D. Kotzin 1981 87 p
Avail: Univ. Microfilms Order No. 8124932

Short range optical communication using diffusely scattered infrared radiation is examined. Aspects which relate to providing multichannel and duplex capability when one end of the link is not fixed, are considered. A link comparison is made between optical and microwave systems of similar complexity. Although it is shown that the optical system is not as sensitive as its microwave counterpart for typical ambient infrared backgrounds, it is advantageous with regard to spectrum availability and reuse, immunity from multipath distortion, and the maturity of the technology. Characteristics of the optical scatter propagation path are investigated using a static analytical model. Measurements of dynamic path loss provide data for the portable application. A signal to noise ratio enhancement is obtained by the use of short high power optical pulses. Selection of a digital modulation format permits the application of time division multiplex techniques to achieve the desired duplex and multichannel capability. System capabilities are demonstrated to be strongly influenced by device limitations, especially the light emitting diode (led) sources. A method of obtained receiver gain using detector optics is described and explained. Finally, the analysis and measured data are used to guide the design of a prototype portable telephone system providing two full duplex audio channels using digitally encoded speech is described. Dissert. Abstr.

N82-13345 Stanford Univ., Calif.
SPECTRAL EFFICIENCY OF AMPLITUDE COMPANDED SIDEBAND SYSTEMS Ph.D. Thesis
Mark Alan Herro 1981 177 p
Avail: Univ. Microfilms Order No. 8124083

A computer model which incorporates the various factors affecting the performance of a mobile radio system in an interference dominated environment is used to compare the efficiency and service quality of both FM and amplitude companded sideband (ACSB) radios in different types of land mobile services. Techniques for modeling the adjacent channel performance and the effect of frequency error between two radios are developed. The ACSB radios have 1.5 to 2 times the range of the FM radio with equal power. With regards to adjacent channel interference, ACSB with 5 kHz channel separation performs as well as FM with 20 or 25 kHz separation. When both co-channel and adjacent channel interference are taken into account, ACSB is about 6 to 8 times more efficient than FM as far as maximizing the number of users supported per MHz per square kilometer in any given service area. Dissert. Abstr.

N82-13346 Stanford Univ., Calif.
TOPICS IN DIGITAL SIGNAL PROCESSING Ph.D. Thesis
Shankar Seshagiri Rao Narayan 1981 135 p
Avail: Univ. Microfilms Order No. 8124116

Three discrete Fourier transform (DFT) algorithms, namely, the fast Fourier transform algorithm (FFT), the prime factor algorithm (PFA) and the Winograd Fourier transform algorithm (WFTA) are analyzed and compared. A new set of short-length DFT algorithms well-suited for special purpose hardware implementations, employing monolithic multiplier-accumulators and microprocessors, are presented. Architectural considerations in designing DFT processors based on these algorithms are discussed. Efficient hardware structures for implementing the FFT and the PFA are presented. A digital implementation for performing linear-FM (LFM) pulse compression by using bandpass filter banks is presented. The concept of transform domain adaptive filtering is introduced. The DFT and the discrete cosine transform (DFT) domain adaptive filtering algorithm are considered. Applications of these in the areas of speech processing and adaptive line enhancers are discussed. A simple waveform coding algorithm capable of providing good quality speech at about 1.5 bits per sample is presented. Dissert. Abstr.

N82-13347 New Mexico Univ., Albuquerque.
ESTIMATION OF VARIABLE LATENCY SIGNALS VIA UNWRAPPED PHASE AVERAGING WITH APPLICATION TO VISUAL EVOKED POTENTIALS Ph.D. Thesis
Michael Antonio Rodriguez 1980 89 p
Avail: Univ. Microfilms Order No. 8123966

A formula for phase estimation via unwrapped phase averaging is developed empirically using simulations where signal and noise have similar spectral densities. The result is a phase estimator in which the parameters depend only on the signal-to-noise ratio. A relationship between signal phase error and signal waveform error is derived to assist in the selection of estimator parameters and to evaluate subsequent performance of the phase estimation procedure. A new cepstral function, the delay phase cepstrum, is also introduced and found to be useful in estimating the mean delay of a known signal waveform which has a variable latency in an ensemble of measurements. Extensive simulations indicate that estimation via unwrapped phase averaging can recover variable latency signals under very poor signal-to-noise conditions. Application of the new technique to the estimation of visual evoked potentials is presented and discussed.
Dissert. Abstr.

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N82-13348 Wisconsin Univ. - Madison.
AC HARMONIC FILTERING USING CONTROLLED CURRENT INJECTION Ph.D. Thesis
Gary Roy Dreifuerst 1981 238 p
Avail: Univ. Microfilms Order No. 8117511

Development of a test model demonstrating the feasibility of an active tracking filter for power system harmonics. The sources of power system harmonics are reviewed, including the effects harmonic have on communication and control systems. The standard harmonic filtering technique and converter control schemes which minimize harmonic production are discussed. Four approaches for harmonic filtering are considered. The active tracking filter theory is presented to a standard passive filter and compared using steady state simulation. A state-of-the-art multi-processor controlled model is designed and constructed. The model incorporates an extensive data acquisition unit which allows great flexibility for experimental work. The model test results are presented illustrating protection functions, steady-state operation, and dynamic responses which show that the active tracking filter approach is feasible. Dissert. Abstr.

N82-13349 Wisconsin Univ. - Madison.
DEVELOPMENT, ANALYSIS AND CONTROL OF THE INDUCTOR-CONVERTER BRIDGE Ph.D. Thesis
Mehrdad Ehsani 1981 357 p
Avail: Univ. Microfilms Order No. 8117512

The inductor-converter bridge (ICB) is a solid state DC-AC-DC power converter system for bidirectional, controllable, energy transfer between two high Q magnet coils. The analysis and control of the ICB system was investigated. The process of energy transfer between the coils is explained on the basis of a simple one line equivalent circuit. The changes in the average power, average coil currents, and voltages, as functions of time, are calculated by the conventional Fourier method of analysis. A method of analyzing the ICB circuit by the use of quadrometric functions and identities is presented. The method delivers closed form expressions in finite series form. Since the power in the ICB is controlled by phase and/or frequency modulation, a methodical way of executing phase frequency shifting transients, without upsetting the normal operating conditions of the system was developed. A time optimal, load current feedback, control algorithm was developed, based on the analytically understood behavior of the system. Testing and experimental evaluation of the control algorithm are described. Dissert. Abstr.

N82-13350 Stanford Univ., Calif.
CHARGE-BASED MODELING OF CAPACITANCE IN MOS TRANSISTORS Ph.D. Thesis
Donald Edward Ward 1981 162 p
Avail: Univ. Microfilms Order No. 8124169

Conventional transistor models for the transient simulation of MOS circuits are formulated in terms of nonlinear capacitors. A charge-based model was developed to overcome errors and to account for the bulk charge. It is shown that the capacitances between any pair of terminals are nonreciprocal. Bulk-source, bulk-drain, and drain-source couplings are modeled, as are gate-to-bulk capacitances in saturation. The drain-source capacitances are negative. The capacitance characteristics of the model verified experimentally. The impact of the charge-based model on simulation of practical circuits was considered. Although the model is particularly useful in simulating silicon-on-insulator circuits, it gives improved simulation of bulk MOS technologies as well. Although the derivations are strictly valid only for long-channel devices operating at low speed, the model should prove useful for the simulation of practical circuits using state-of-the-art technology. Extensions of the model to short-channel devices and high-speed operation are discussed.
Dissert. Abstr.

N82-13351 Northwestern Univ., Evanston, Ill.
CONDUCTIVITY AND PERMITTIVITY MEASUREMENTS OF FAST ION CONDUCTORS IN THE MICROWAVE REGION Ph.D. Thesis
Thomas Tang Yum Wong 1981 216 p
Avail: Univ. Microfilms Order No. 8125042

The conduction and dielectric properties of fast ion conductors in the microwave and radio frequency regions are investigated. Techniques of microwave dielectric spectroscopy pertinent to fast ion conductors are studied. Special effort is devoted to polycrystalline materials. Ag_2HgI_4 is chosen as the model material. Observed spectra and thermal activation effects reveal distinctive features separating the ionic conducting alpha-phase (above 50 C) from the electronic conducting beta-phase (below 50 C). Transport processes in the former can be described by hopping models whereas those in the latter can be accounted for as the remains of the infrared oscillator mode. Based on rate theory, a simple model giving the dielectric response associated with hopping conduction is constructed. It is demonstrated that in order to give a realistic description of ionic motion in the dc limit, one must consider the flux of ion across the potential barrier rather than the rate of change of polarization or the continuity equation. Explicit equations relating the complex conductivity to lattice parameters and temperature are derived. Dissert. Abstr.

N82-13352 Stanford Univ., Calif.
LINEAR ACOUSTO-OPTIC FILTERING WITH HETERODYNE AND FREQUENCY-PLANE CONTROL Ph.D. Thesis
Jerry Lee Erickson 1981 306 p
Avail: Univ. Microfilms Order No. 8124059

The basic principles, characteristics and limitations of the linear, acousto-optic, heterodyne, frequency plane (LAHF) filter are described. The related area of phase distortion introduced by the acousto-optic interaction is also examined. A general LAHF filter response is derived. A specific LAHF filter response form useful for narrowband frequency rejection is studied with computer simulation and verified experimentally. Tradeoffs among window apodization, frequency rejection notch width, and filter time delay are discussed. The properties of heterodyne detection with a large-area photodetector in relation to the LAHF filter are examined. The dynamic range of the LAHF filter is calculated and optimized. The signal-to-noise ratio is seen to be inversely proportional to the filter time-bandwidth product. Acousto-optic phase distortion is also studied and related to phase distortion in the LAHF filter response. One source of potential phase distortion is shown to be the planar, acousto-optic-medium-to-air boundary. Another source of acousto-optic phase distortion is shown to be the acousto-optic diffraction process. To demonstrate this, a new highly accurate model for weak acousto-optic diffraction in isotropic media is derived. Dissert. Abstr.

N82-13353 Stanford Univ., Calif.
A RELATIVISTIC MAGNETRON WITH A THERMIONIC CATHODE Ph.D. Thesis
William Parker Ballard 1981 165 p
Avail: Univ. Microfilms Order No. 8124030

The design and development of a relativistic magnetron are described. Target pulse lengths of one microsecond and mean pulse powers of one gigawatt were selected and an oxide cathode was chosen because the space-charge should inhibit vacuum dc breakdown between the anode and cathode, thus allowing longer pulses than are achieved with other relativistic designs employing cold, field-emitting cathodes. A high power tube was nonrelativistically scaled to an operating voltage of 500 kilovolts. The resulting anode has twelve resonators and was operated with one end short-circuited to rf. An impregnated tungsten matrix cathode and a coated cathode were tested. The coated cathode, which was found to be more tolerant of the poor vacuum, emitted successfully. A rf measurement technique provided simultaneous power and frequency information during each pulse. The magnetron operated in the desired mode at power levels of about 20 megawatts for pulse lengths of about 35 nanoseconds. Dissert. Abstr.

N82-13354 Stanford Univ., Calif.
FREQUENCY SAMPLING FILTERS, DESIGN AND APPLICATIONS Ph.D. Thesis
Amnon Aliphas 1981 126 p
Avail: Univ. Microfilms Order No. 8124027

A linear programming method of reduced complexity is developed for the design of FIR frequency sampling digital filters. The frequency sampling method can be used directly in the frequency domain when implementing filtering by fast convolution using discrete Fourier transforms. For narrowband filters or filter banks, methods are shown which significantly reduce the required multiplication operations per data point in filter implementations. A general result is presented on the problem of finding the zeros of the transfer function of an FIR filter. This problem arises when it is necessary to convert a linear phase digital filter design into a minimum phase design. It also arises if it is desired to implement a high order filter by the cascading of a number of low order filters. A method is developed for the computation of the zeros of filters which have been designed by the frequency sampling technique. For such designs the locations of all zeros on the unit circle are known. Dissert. Abstr.

N82-13355 Wisconsin Univ. - Madison.
DIRECT DIGITAL SIMULATION OF POWER SEMICONDUCTOR-CONTROLLED ELECTRICAL MACHINES Ph.D. Thesis
Hamdy Mohamad Bahnassy 1981 605 p
Avail: Univ. Microfilms Order No. 8120296

Generalized computer programming techniques for simulating power semiconductor-controlled electric machines in coil-variable representation are presented. These techniques are developed primarily for implementation in large scale general purpose computer-aided design and analysis (CADA) circuit programs. To demonstrate the validity of the developed techniques, a coil-variable model of a brushless synchronous generator with an ac exciter and rotating rectifiers was constructed. The performance of the control system (thyristor voltage regulator) is represented by a transfer function block diagram model. The CADA circuit program used is the recently developed SUPER SCEPTRE program. The model is validated using the design data

and test results of a 60 kVA brushless generator. Numerous computer simulation cases are presented including the steady state and transient conditions. Brushless generator performance under diode failure faults (opened-diode, shorted-diode) is simulated. The effects of the external faults, at the main generator terminals, on the main generator, as well as its excitation system currents, are simulated. Dissert. Abstr.

N82-13356*# Santa Barbara Research Center, Goleta, Calif.
ADVANCED INDIUM ANTIMONIDE MONOLITHIC CHARGE COUPLED INFRARED IMAGING ARRAYS Final Report
T. L. Koch, C. A. Merilainen, and R. D. Thom Nov. 1981 66 p refs
(Contract NAS1-16383)
(NASA-CR-165799) Avail: NTIS HC A04/MF A01 CSCL 09A

The continued process development of SiO2 insulators for use in advanced InSb monolithic charge coupled infrared imaging arrays is described. Specific investigations into the use of plasma enhanced chemical vapor deposited (PECVD) SiO2 as a gate insulator for InSb charge coupled devices is discussed, as are investigations of other chemical vapor deposited SiO2 materials. Author

N82-13357*# Westinghouse Electric Corp., Lima, Ohio. Electrical Systems Div.
HIGH VOLTAGE DC SWITCHGEAR DEVELOPMENT FOR MULTI-KW SPACE POWER SYSTEM: AEROSPACE TECHNOLOGY DEVELOPMENT OF THREE TYPES OF SOLID STATE POWER CONTROLLERS FOR 200-1100VDC WITH CURRENT RATINGS OF 25, 50, AND 80 AMPERES WITH ONE TYPE UTILIZING AN ELECTROMECHANICAL DEVICE Final Report
W. W. Billings Nov. 1981 187 p
(Contract NAS3-21755)
(NASA-CR-165413; WAED-81-05E) Avail: NTIS HC A09/MF A01 CSCL 09C

Three types of solid state power controllers (SSPC's) for high voltage, high power DC system applications were developed. The first type utilizes a SCR power switch. The second type employes an electromechanical power switch element with solid state commutation. The third type utilizes a transistor power switch. Significant accomplishments include high operating efficiencies, fault clearing, high/low temperature performance and vacuum operation. E.A.K.

N82-13358# Naval Surface Weapons Center, White Oak, Md. Underwater Systems Dept.
MAGNETICALLY UNDETECTABLE ELECTRONIC CIRCUIT ASSEMBLIES
Hayden Morris 3 Oct. 1980 28 p refs
(AD-A100669; NSWC/TR-80-441) Avail: NTIS HC A03/MF A01 CSCL 17/4

A technique was devised for the fabrication of a nonmagnetic hermetic package to house nonmagnetic hybrid microelectronic circuits. The technique relies on the use of a standard type of metallized alumina ceramic flat package. Conductor metallization was modified to eliminate the nickel layer. Gold-plated copper was used for the external leads, using thermocompression bonding techniques. Media for hermetically sealing the cover to the circuit substrate holder include low temperature glass or solder, epoxy, or welding. N.W.

N82-13359# IBM Watson Research Center, Yorktown Heights, N.Y.
STUDY OF THE PHYSICS OF INSULATING FILMS AS RELATED TO THE RELIABILITY OF METAL-OXIDE SEMICONDUCTOR DEVICES Final Report, 1 Sep. 1978 - 30 Nov. 1980
John M. Aitken, J. Calise, Roger F. DeKeersmaecker, K. DeMeyer, and D. J. DiMaria Griffiss AFB, N. Y. RADC Jul. 1981 204 p refs
(Contract F19628-78-C-0225; ARPA Order 2180; AF Proj. 2180)
(AD-A105030; RADC-TR-81-113) Avail: NTIS HC A10/MF A01 CSCL 20/12

These papers discuss electron trapping on sites related to H2O, the subsequent interface states generated by the trapping, and the reduction of these traps by high temperature nitrogen annealing. Radiation induced neutral trapping centers are discussed in relation to electron or hole capital on them. A new electrically alterable memory device using a dual electron injector structure composed of silicon-rich silicon dioxide and silicon dioxide layers is described. Material characterization is the Fi-rich SiO subscript 2 film, discussed using attenuated total reflectance, raman scattering, and optical absorption measurements. Detection of trap impurities, on Fi surfaces is studied using electron trapping character techniques. Author (GRA)

N82-13360# SRI International Corp., Menlo Park, Calif.
THE CHEMICAL VAPOR DEPOSITION OF IRIDIUM Final Report
John B. Mooney, Robert T. Rewick, Daniel L. Haynes, Thomas E. Gray, and David M. Vandenberg Jul. 1981 34 p refs
(Contract N00014-79-C-0880; SRI Proj. 1013)
(AD-A104582) Avail: NTIS HC A03/MF A01 CSCL 09/1

The preparation of iridium films for thermionic cathodes by chemical vapor deposition is described. The deposition from IrC13/H2/CO atmospheres was very inefficient; however, iridium was deposited from IrF3/H2/CO at 465 C + or - 25 C with reasonable efficiency. The majority of the deposits were porous or loose powders. An attempt to deposit iridium on a substrate designed to produce a microporous film was unsuccessful because of the poor throwing-power of the process. Author

N82-13361# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
EXPLOSIVE-METAL COMPOSITES AND ELECTRICAL SWITCH TECHNOLOGY Final Report
M. J. Frankel and P. J. DiBona 13 Apr. 1981 21 p refs Sponsored in part by AF
(AD-A099476; NSWC/TR-80-497) Avail: NTIS HC A02/MF A01 CSCL 11/4

A number of different explosive opening switch concepts were investigated. The fabrication of a composite material by the impregnation of a porous metallic matrix by an explosive utilizing a vacuum melt cast technique was demonstrated. Successful initiation and steady detonation wave propagation was demonstrated with use of the Jacobs rapid framing camera while the electrical conductivity through the sample was measured with an oscilloscope. This type of switch is shown to have the potential of switching large electrical currents in times on the order of 10 microns with savings in weight and volume as compared to the geometries used in other explosive switches. Author

N82-13362# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
BOUNDING SIGNAL LEVELS AT TERMINATIONS OF MULTICONDUCTOR TRANSMISSION LINE BEHIND AN APERTURE Scientific Final Report, 1 Feb. 1980 - 15 Apr. 1981
W. A. Davis and Sistanizadeh 4 Jun. 1981 128 p refs
(Grant AF-AFOSR-0138-80)
(AD-A102031; AFOSR-81-0587TR) Avail: NTIS HC A07/MF A01 CSCL 09/1

A technique for bounding the maximum voltages and currents at terminations of a multiconductor transmission line located behind an aperture-perforated conducting screen excited by an electromagnetic pulse is developed. The electromagnetic field is coupled through a small aperture to provide the excitation of a multiconductor transmission line behind the aperture. A model is presented in terms of external and internal sources which in turn creates traveling waves on the multiconductor transmission line. Upper bounds are obtained using vector norms and associated matrix norms. The frequency domain is formulated and transformed to the time domain to obtain useful upper bounds for transient analysis of multiconductor transmission line geometries with aperture excitation. S.L.

N82-13363# Army Missile Command, Redstone Arsenal, Ala. Directed Energy Directorate.
SOME EXPERIENCES WITH THE USE OF CASTOR OIL AS A DIELECTRIC
Vernon A. Nieberlein Jan. 1981 23 p refs
(AD-A102348; AD-E950151) Avail: NTIS HC A02/MF A01

CSCL 11/8

The use of large volumes of castor oil for dielectric purposes is reported. The experiences include corrosion of brass parts by the oil, drying of the oil, and the determination of water in the two-phase system of caster oil in contact with mineral oil. A detailed design of a packed column for drying castor is also presented. Author

N82-13364# Raytheon Co., Bedford, Mass.
DESIGN AND FABRICATE A CCD ANALOG MULTIPLIER Final Technical Report, 30 Sep. 1977 - 31 Oct. 1980
Jay P. Sage and Douglas E. Greetham Griffiss AFB, N.Y. RADC Aug. 1981 136 p refs
(Contract F19628-77-C-0260; AF Proj. 2305)
(AD-A105557; BR12597; RADC-TR-81-155) Avail: NTIS HC A07/MF A01 CSCL 09/5

A CCD-based correlator/convolver having 256 stages at which two analog signals are multiplied and summed has been designed, fabricated and tested. The design employs two dual-channel (surface channel) CCD's, source-follower buffered switched floating gate taps at each stage, diode injection input; and as the key 'breakthrough' element in the design, the analog multipliers are configured as four-transistor MOSFET balanced bridges. Various elements in the design were chosen and tested in isolation and combination both by means of computer simulations, and by a series of test 'pattern mask measurements in three wafer fabrication phases. Despite the size and complexity of the chip (8.7 Mn x 3.25 Mn, 4128 CCD cells and 4132 transistors), a good yield of 256 stage devices that functioned satisfactorily as correlators was obtained. On the basis of limited testing, the level of performance, however, fell short of that expected from previous component tests notably in the area of linearity of correlation (+ or - 5% rather than + or - 1%) and in speed (< or = 1 MHz rather than 10 MHz). Suggestions for further tests and experiments are given. Author (GRA)

N82-13365# Sandia Labs., Albuquerque, N. Mex.
PHOTON-ELECTRON CORRELATION IN THE LABORATORY TESTING OF ELECTRONIC COMPONENTS. PART 2: BEAM CONDITIONING AND DIAGNOSTICS
L. D. Posey and W. Beezhold 1981 104 p refs Presented at the AWRE/SNLA/DNA Joint Conf., Aldermaston, England, 6 Mar. 1981
(Contract DE-AC04-76DP-00789)
(DE81-026606; SAND-81-1578C-Pt-2; CONF-810388-1) Avail: NTIS HC A06/MF A01

The limitations of using electrons to simulate the effects of high dose rate flash X-ray irradiations for TREE studies were determined. Diagnostic testing techniques were developed for such simulation and are described. The use of suitable dosimetry techniques for high total dose/dose-rate irradiations was demonstrated. T.M.

N82-13366# Sandia Labs., Albuquerque, N. Mex. IC Process Development and Control Div.
EFFECT OF GATE OXIDE THICKNESS ON THE RADIATION HARDNESS OF SILICON-GATE CMOS
T. V. Nordstrom and C. F. Gibbon 1981 24 p refs Presented at the IEEE Conf. on Nucl. Sci. and Space Radiation, Seattle, 21 Jul. 1981
(Contract DE-AC04-76DP-00789)
(DE81-027202; SAND-81-1680C; CONF-810797-7) Avail: NTIS HC A02/MF A01

Significant improvements have been made in the radiation hardness of silicon-gate CMOS by reducing the gate oxide thickness. The device studied is an 8-bit arithmetic logic unit designed with Sandia's Expanded Linear Array standard cells. Devices with gate oxide thickness of 400, 570 (standard), and 700 A were fabricated. N- and P-channel maximum threshold shifts were reduced by 0.3 and 1.2 volts, respectively, for the thinnest oxide. Approximately, a linear relationship is found for threshold shift versus thickness. The functional radiation hardness of the full integrated circuit was also measured. DOE

N82-13367# Tennessee Univ. Space Inst., Tullahoma. Energy Conversion Div.
TWO-DIMENSIONAL EFFECTS IN POWER TAKE-OFF REGION
M. Ishikawa and Y. C. L. Wu May 1981 29 p refs
(Contract DE-AC02-79ET-10815)
(DE82-000091; DOE/ET-10815/55) Avail: NTIS HC A03/MF A01

A two-dimensional analytical model of the power take-off (PTO) region of a diagonal conducting wall MHD generator is presented and compared with experimental results. Reasonable agreement was found in both voltage and current distributions from the two-dimensional analysis, while similar comparison of experimental data with one-dimensional calculations with experiments was not satisfactory. Power take-off from mid-channel was also investigated. It was found that larger current was carried by these electrodes. In addition, large circulating current was found in the sidewalls resulting from diagonalization. Therefore ballast resistors are required to equalize the current. A general PTO resistor design was proposed. Trade-off considerations between power output and protection of over-current were made. DOE

N82-13368# General Electric Co., St. Petersburg, Fla. Corporate Research and Development Dept.
EVALUATION OF ADVANCED TECHNOLOGIES FOR POWER TRANSFORMERS Final Report
Jan. 1981 173 p refs
(Contract DE-AC01-77ET-29069)
(DE82-000793; NYSERDA-81-8) Avail: NTIS HC A08/MF A01

The high insulating strength of certain gases, such as sulfur hexafluoride, when used at high pressure, suggests that there may be advantages to compressed gases as the insulating fluid in power transformers. However, simply exchanging the oil for compressed gas in an otherwise conventional transformer design will not yield a significant overall advantage. Compressed gases present the engineer with properties which are quite different from mineral oil. If gases are to be used as the major insulating fluid in power transformers, then virtually all aspects of the insulation and cooling of the apparatus must be reconsidered, affording an opportunity to introduce new design concepts, new materials, and new construction techniques. In this program, the feasibility of using the following principal design concepts has been explored: sheet conductors for the windings; a system of sealed, self-contained, annular cooling ducts containing circulating cooling fluid to cool the windings; polymer film for turn-to-turn insulation; and compressed gas insulation. Experimental and analytical studies, described in this report, indicate that the sheet-wound, compressed-gas-insulated design should result in power transformers of significantly smaller size and weight when compared with oil-filled units of equivalent rating. These advanced technologies offer the opportunity for the design of more efficient power transformers. DOE

N82-13369# Siemens A.G., Munich (West Germany). Component Div.
FURTHER DEVELOPMENTS IN INTEGRATED CIRCUIT ASSEMBLING TECHNOLOGY Final Report
Hans Ullrich Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 62 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-179; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13

Recent developments aiming at full automation in the assembling technology of plastic encapsulated integrated circuits (IC) are described, covering die separation, chip adhesion and wire bonding. For IC die separation in individual chips, a diamond sawing procedure which replaces the traditional scratch and break technique is proposed. Die attachment by means of a silver-filled adhesive was extended to MOS and power devices. A half-automated universal chip adhesion machine was designed and tested. A positioning system based on chip edge pattern recognition was developed. The prototype of a fully automated wire bonding system was successfully tested. The technical and economical advantages of these improved technologies are discussed. Author (ESA)

N82-13370# Centre d'Etudes et de Recherches, Toulouse (France). Dept. d'Etudes et de Recherches en Automatique

VALIDATION, MODELING, AND COMPUTER ASSISTED DESIGN PROGRAM FOR POWER CONVERTERS Final Report [VALIDATION, MODELISATION ET LOGICIEL DE CONCEPTION ASSISTEE DES CONVERTISSEURS DE PUISSANCE]
M. Clique and A. J. Fossard Paris ESA Jun. 1981 82 p refs In FRENCH
(Contract ESTEC-3652/78/NL-AK(SC))
(ESTEC/DERA-8/7208; ESA-CR(P)-1454) Avail: NTIS HC A05/MF A01

Work carried out in order to determine the dynamic performance of dc/dc converters is summarized. The modeling of limit cycling current control as well as maximum current control (buck; boost) is briefly discussed, emphasizing the adaptability of the method. The computerized design program used in describing the systems in which the converters operate is mentioned, again pointing out its flexibility. The recording and processing of measurement data from breadboard model converters is then reported on. Least squares was employed as an identification method with all converters. Measured results and predicted results agree well up to approximately 2 or 3 KHz. At higher frequencies the introduction of parasite effects into the program and the precise modeling of certain complex filters remains problematic. Author (ESA)

N82-13371 Drexel Univ., Philadelphia, Pa.
ANAMOLOUS LOSS IN TRANSFORMER STEELS Ph.D. Thesis
Bryen Edward Lorenz 1981 103 p
Avail: Univ. Microfilms Order No. 8118932

Energy losses in transformer steels, specifically silicon-iron, are investigated. In the model proposed discontinuous magnetization transition, is introduced as a loss mechanism, in addition to the continuous magnetization change produced through domain wall motion. This extra mechanism is in the form of discrete sites, distributed randomly throughout the sample, which are statistically activated to switch through the action of the wall in depinning the sites. Once unpinned the sites have a relaxation time that is independent of the frequency of magnetization. The effect of two such sites is computed by using standard boundary value techniques to yield the generated eddy currents. By averaging both spacially and temporally over a cycle, the effect of an ensembie of these sites can be determined. Dissert. Abstr.

N82-13372 Stanford Univ., Calif.
A SIMPLIFIED TWO-DIMENSIONAL NUMERICAL ANALYSIS OF MOS DEVICES INCLUDING TRANSIENT PHENOMENA Ph.D. Thesis
Soo-Young Oh 1981 162 p
Avail: Univ. Microfilms Order No. 8124123

A two-dimensional approached for steady state analysis based on the boundary-value (BV) method is described. It solves the current-continuity equations numerically along the channel, with appropriate two-dimensional field coupling to the boundary conditions to include the two-dimensional and distributed-circuit effects. Because the nodes are allocated only along the boundaries and channel, their number is nearly two orders of magnitude smaller and the calculation speed is one order of magnitude faster than those obtained by either the finite-difference or finite-element method. The BV method was employed to analyze the transient characteristics of MOS transistors. The accuracy of the quasi-static model was studied and important transient phenomena such as the delay time caused by channel transit and charge pumping current were investigated through both measurements and simulation. Short-channel effects were also simulated and predicted by the new method. Dissert. Abstr.

N82-13373 Florida Univ., Gainesville.
BIPOLAR CONDUCTION WITH a.c. EXCITATION Ph.D. Thesis
Walter Devaun Stanaland 1981 361 p
Avail: Univ. Microfilms Order No. 8124457

A mathematical model of the bipolar drift dominated conduction process utilizing ac voltage excitation in dielectric liquids was developed to obtain numerical solutions for the time dependence of the spatial electric field and charge density distributions along with terminal current. The disagreement between theory and measurement is investigated by a refined conduction model based on charged particle transport, an equivalent circuit based on particle characteristics and an orientational polarization model of the particles. Since the collection of particles on an electrode during a half cycle depends on particle mobility and half cycle time, the number of particles collecting on the electrodes undergoing orientational polarization increases with decreasing frequency. Particle mobility is shown to be proportional to charge. It is concluded that the modeling and measurement processes which explain the electric field and charge density distributions depend on particle characteristics such as number density, size, mass, charge, mobility, and viscous drag coefficient. Dissert. Abstr.

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N82-13374 Purdue Univ., Lafayette, Ind.
APPLICATION OF THE METHOD OF WEIGHTED RESIDUALS TO THE BOUNDARY LAYER MOMENTUM AND TURBULENT STRESS TRANSPORT EQUATIONS Ph.D. Thesis
Donald William Davis, Jr. 1981 181 p
Avail: Univ. Microfilms Order No. 8123631

A method for the analysis of the turbulent boundary layer under the influence of a pressure gradient is developed. The governing equations are the continuity equation, the boundary layer mean momentum equation, and the boundary layer turbulent kinetic energy equation. The kinetic energy equation is transformed into an equation which governs the transport of turbulent shear stress. This transformation is accomplished through the use of three empirical functions which relate the turbulent kinetic energy, the turbulent energy diffusion, and the turbulent energy dissipation to the Reynolds stress. These empirical functions are determined completely from zero pressure gradient boundary layers. The method is applied to several sets of experimental data including flows with zero pressure gradient, favorable pressure gradient, and adverse pressure gradient. Results are given for comparisons of skin friction coefficient, thickness parameters, mean velocity profiles, and Reynolds stress profiles. Dissert. Abstr.

N82-13375 Georgia Inst. of Tech., Atlanta.
SEPARATE NUMERICAL TREATMENT OF ATTACHED AND DETACHED FLOW REGIONS IN GENERAL VISCOUS FLOWS Ph.D. Thesis
Ulgen Gulcat 1981 134 p
Avail: Univ. Microfilms Order No. 8124291

A method for the separate computation of the attached and detached region in a general viscous flow is presented. The method is mainly based on a general kinematic relationship between the velocity and the vorticity fields. This relationship permits the needed boundary conditions for the boundary layer region to be determined accurately and uniquely from a knowledge of the vorticity distribution. The kinetic part of the flow deals with the vorticity transport equation. The method yields a numerical procedure treating the boundary layer equations in the attached and Navier-Stokes equations in the detached regions of the flow. The accuracy and the versatility of the method is demonstrated by treating some simple flow geometries, namely flow past a finite plate and flow past a circular cylinder. The results obtained are in good agreement with the available solutions and with the experimental data. Finally, the flow past a 9 percent thick symmetric Jouskowski airfoil at 15 deg angle of attack is investigated. The results are presented in terms of streamlines, equi-vorticity contours, surface pressure and surface vorticity distributions at various time levels. Dissert. Abstr.

N82-13376* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CONTROLLED OVERSPRAY SPRAY NOZZLE Patent
Willibald P. Prasthofer, inventor (to NASA) Issued 17 Nov. 1981

6 p Filed 29 Feb. 1980 Supersedes N80-20528 (18 - 11, p 1415)
(NASA-Case-MFS-25139-1; US-Patent-4,300,723; US-Patent-Appl-SN-126138; US-Patent-Class-239-499; US-Patent-Class-239-589; US-Patent-Class-239-601) Avail: US Patent and Trademark Office CSCL 20D

A spray system for a multi-ingredient ablative material wherein a nozzle A is utilized for suppressing overspray is described. The nozzle includes a cyclindrical inlet which converges to a restricted throat. A curved juncture between the cylindrical inlet and the convergent portion affords unrestricted and uninterrupted flow of the ablative material. A divergent bell-shaped chamber and adjustable nozzle exit B is utilized which provides a highly effective spray pattern in suppressing overspray to an acceptable level and producing a homogeneous jet of material that adheres well to the substrate.

Official Gazette of the U.S. Patent and Trademark Office

N82-13377 Purdue Univ., Lafayette, Ind.
APPLICATION OF A GRAVITY-DRIVEN WICKLESS HEAT PIPE FOR ICE PRODUCTION IN A COLD ENERGY STORAGE SYSTEM Ph.D. Thesis
Shun-Lung Chao 1981 255 p
Avail: Univ. Microfilms Order No. 8123621

Use of seasonal cold storage for space cooling is considered. A simplified analytical model, simulated by a computer program, was developed to predict the system performance. Experiments were performed to study the effects of various parameters on the ice formation. Parameters studied include the quantity of working fluid, condenser length, coolant inlet temperature, cooling time, type of working fluid, and inclination of the heat pipe. The effects of these parameters on the volume and shape of the resulting ice formation and on the wall temperature distribution along the heat pipe are illustrated. Evaporation and condensation phenomena within the heat pipe were investigated. The influence of natural convection on the geometry and structure of the ice is also discussed. The analytical model was found to be adequate for predicting the rate of ice formation and the geometry associated with the ice-water interface, and was verified by comparisons with experimental observations. Dissert. Abstr.

N82-13378 California Univ., Los Angeles.
THE RELATIONSHIP BETWEEN THE ACOUSTIC IMPEDANCE AND UNSTEADY FLOW FIELD NEAR THE ORIFICE OF A TWO DIMENSIONAL HELMHOLTZ RESONATOR IN GRAZING FLOW Ph.D. Thesis
Bruce Eliot Walker 1981 161 p
Avail: Univ. Microfilms Order No. 8122878

The acoustic impedance of single and multiple orifice Helmholtz resonators which changes from its nominal value when the resonator is exposed to a steady grazing flow across its orifice(s) is discussed. The acoustic resistance rises, approximately proportionally to the speed of the grazing flow, while the acoustic reactance decreases. To understand better the physical mechanisms responsible for these changes, the unsteady flow of field within and near the orifice of a two dimensional single orifice Helmholtz resonator was measured on a microscopic scale. The data were displayed as waveforms, Fourier Series, perturbation velocity vector maps and pathline traces. Two models of the flow are suggested. Dissert. Abstr.

N82-13379 Northwestern Univ., Evanston, Ill.
ENERGETICS AND DYNAMICS OF DROPLET EVAPORATION IN HIGH TEMPERATURE INTERMEDIATE REYNOLDS NUMBER FLOWS Ph.D. Thesis
Metin Renksizbulut 1981 236 p
Avail: Univ. Microfilms Order No. 8124988

Nusselt Numbers and drag coefficients of single-component liquid droplets and solid spheres in high temperature, intermediate Reynolds Number flows were investigated. The evaporation of suspended water, Methanol and n-Heptane droplets were followed in laminar air streams up to 1059 K in temperature using a steady-state measurement technique. It is found that the dynamic blowing effect of evaporation causes large reductions in heat transfer rates, and that the film conditions constitute an appropriate reference state for the evaluation of thermophysical properties. The numerical results indicate that the blowing effect of evaporation on momentum transfer is to reduce friction drag very significantly but at the same time increase pressure drag by almost an equal amount; the net effect on the total drag force being only a marginal reduction. In all cases, it is found that thermophysical property variations play a very dominant role in reducing the drag forces acting on cold particles. Results are analysed and a correlation for stagnation-point heat transfer is also presented. Dissert. Abstr.

N82-13380 Nevada Univ., Reno.
EXPERIMENTAL DETERMINATION OF THE EFFECT OF PHYSICAL PROPERTIES ON THE DRAG OF LIQUID DROPS Ph.D. Thesis
Phillip Hugh Gillaspy 1981 70 p
Avail: Univ. Microfilms Order No. 8123955

The drag coefficient of drops of various liquids falling in air was measured experimentally. In one series of measurements the viscosity was changed while the surface tension was held constant, thus isolating the effects of liquid viscosity. It was found that the drag increased as the viscosity increased up to a value of 50 centipoises when essentially infinite viscosity was reached and there was no further increase in drag. Differences in the properties of Newtonian and non-Newtonian liquids were tested by thickening liquids with different agents. No difference in the drag due to the inherent rheological properties of Newtonian and non-Newtonian liquids were measured. With the effect of viscosity isolated, the effect of surface tension alone was then determined. All measurements were analyzed and empirical formulas expressing the drag coefficient in terms of the viscosity, surface tension, and Reynolds number were deduced.

Dissert. Abstr.

N82-13381 Northwestern Univ., Evanston, Ill.
NUMERICAL METHODS FOR THE ANALYSIS OF FLUID-STRUCTURE INTERACTION PROBLEMS Ph.D. Thesis
Robert Louis Mullen 1981 240 p
Avail: Univ. Microfilms Order No. 8124961

Numerical methods for the solution of transient two-dimensional and axisymmetric three-dimensional fluid solid interaction problems are developed and analyzed. Conservation laws for this kinematic description are developed in both differential and variational forms. The use of an arbitrary moving reference frame for the kinematic description allows the interior of the fluid region to be modeled by a conventional Eulerian description while the solid region is modeled using a Lagrangian description. Since the arbitrary moving frame includes both Eulerian and Lagrangian descriptions as subsets, the interface condition between the fluid and solid can be determined from the kinematics and conservation laws. An implicit finite element approximation is constructed for the governing equations. The properties of the discrete formulation are studied for perturbation and spectral methods. The treatment of impact problems by discrete methods is also examined. Methods to mitigate the additional errors associated with impact problems are given. Dissert. Abstr.

N82-13382 Stanford Univ., Calif.
IMPACTS OF VERTICAL SCALE DISTORTION ON TURBULENT MIXING IN HYDRAULIC MODELS Ph.D. Thesis
Benjamin Rush Roberts 1981 239 p
Avail: Univ. Microfilms Order No. 8124141

A variable distortion physical modeling facility representing a typical cooling pond or lake with a surface jet discharge and submerged power plant intake was used to investigate vertical scale distortion. The primary goals of the study were to establish a quantitative relationship between model scale distortion and turbulent mixing, and to develop a data base (including mean and turbulent quantities, density variations, and flow patterns) which can be used to test and calibrate three-dimensional numerical models. An analytical study of the full equations governing mean and turbulent processes in open water bodies is used to produce, using dimensional analysis techniques, a set of non-dimensional equations which show the impacts of distortion on the terms in the equations. The ultimate result is a set of theoretical predictions for distortion-related impacts on turbulence and mixing. The analytic and experimental results demonstrate a consistent under-prediction of turbulence intensities, vertical mixing rates, and jet dilution by distorted physical models. The far-field impacts of distortion which are observed include modification of advective flow patterns, reduction in boundary

friction effects, and increased transverse and longitudinal dispersion. Dissert. Abstr.

N82-13383*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AERODYNAMIC HEATING ON THE CORRUGATED SURFACE OF A 10.2 DEG HALF-ANGLE BLUNTED CONE AT MACH 6.7
Irving Weinstein, Don E. Avery, and L. Roane Hunt Dec. 1981 45 p refs
(NASA-TP-1928; L-14679) Avail: NTIS HC A03/MF A01 CSCL 20D

A 10.2 deg half-angle blunted cone with corrugated surfaces was tested in the Langley 8-foot high-temperature structures tunnel to measure the aerodynamic heating of its surfaces. The tests were made in a turbulent boundary layer at angles of attack of 0 deg, 5 deg, and 10 deg. Heating of the windward side was in reasonable agreement with theoretical turbulent predictions for a smooth cone, while heating on the leeward side was between laminar and turbulent predictions as a result of local transitional flow or flow separation produced by high lee-side pressures. Localized heating measurements indicated a significant increase in heating at large cross-flow angles, with the maximum heating rates occurring where the flow reattaches on the upstream side of the corrugation crest and the minimum occurring on the downstream side where the flow is separated. Author

N82-13384# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
TECHNICAL EVALUATION REPORT ON THE FLUID DYNAMICS PANEL SYMPOSIUM ON COMPUTATION OF VISCOUS-INVISCID INTERACTIONS
J. C. LeBalleur Oct. 1981 21 p refs Partly in ENGLISH, Partly in FRENCH Symp. held at Colorado Springs 29 Sep 1 Oct. 1980
(AGARD-AR-171; ISBN-92-835-0300-7) Avail: NTIS HC A02/MF A01

The status of current research in computational aerodynamics based on methods solving a viscous-inviscid interaction problem is surveyed. In spite of limitation in the models or numerical techniques for shock wave boundary layer interaction or trailing edge problems, the situation is well advanced in unseparated, steady two-dimensional flow, with the potential approximation for the inviscid part. Progress has advanced in the computation of separations, based on strong interaction models. It would be fruitful to make use of the complete Euler equations in transonic flow. Progress toward strong interaction methods is much less advanced in unsteady or three-dimensional flow, but seems likely. The development of strong interaction methods, highly connected with that of Inviscid and Navier-Stokes numerical techniques, appears as mandatory to having access to practical application needs. Author

N82-13385# Centre National de la Recherche Scientifique, Meudon (France). Lab. d'Aerothermique.
UNDEREXPANDED FREE JETS AND THEIR INTERACTION WITH ADJACENT SURFACES
Jean-Claude Lengrand, Jean Allegre (Societe d'Etudes, de Constructions et de Services pour Souffleries et Installations Aerothermodynamiques), and Michel Riffin (Societe d'Etudes, de Constructions et de Services pour Souffleries et Installations Aerothermodynamiques) 29 Jun. 1981 34 p refs Backup document for AIAA synoptic scheduled for publication in AIAA Journal on Jan. 1982
(LOG-J12276) Avail: NTIS HC A03/MF A01

Based on semiempirical considerations, simple formulas are proposed to describe the flowfield of a highly underexpanded jet exhausting from a sonic or supersonic nozzle. Correlations for density distribution and Mach disc distance include the influence of all governing parameters in the continuum regime. Regarding pressure distribution on a wall impinged by a jet, non-dimensional quantities are defined that greatly reduce the number of parameters involved in the correlations. Formulas and correlations are compared with original as well as previously published experimental results. The degree of rarefaction is discussed. Results on jet-wall interaction are thought to be of practical interest for the design of spacecrafts or launch vehicles. Author

N82-13386*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EXPERIMENTAL AND ANALYTICAL INVESTIGATION OF A FLUIDIC POWER GENERATOR
V. Sarohia, L. Bernal, and R. B. Beauchamp 15 Nov. 1981 81 p refs
(Contract NAS7-100)
(JPL-Pub-81-100) Avail: NTIS HC A05/MF A01 CSCL 20D

A combined experimental and analytical investigation was performed to understand the various fluid processes associated with the conversion of flow energy into electric power in a fluidic generator. Experiments were performed under flight-simulated laboratory conditions and results were compared with those obtained in the free-flight conditions. It is concluded that the mean mass flow critically controlled the output of the fluidic generator. Cross-correlation of the outputs of transducer data indicate the presence of a standing wave in the tube; the mechanism of oscillation is an acoustic resonance tube phenomenon. A linearized model was constructed coupling the flow behavior of the jet, the jet-layer, the tube, the cavity, and the holes of the fluidic generator. The analytical results also show that the mode of the fluidic power generator is an acoustical resonance phenomenon with the frequency of operation given by f approx = a/4L, where f is the frequency of jet swallowing, a is the average speed of sound in the tube, and L is the length of the tube. Analytical results further indicated that oscillations in the fluidic generator are always damped and consequently there is a forcing of the system in operation. M.D.K.

N82-13387# Naval Postgraduate School, Monterey, Calif.
FLOW CHARACTERISTICS OF A MULTIPLE NOZZLE EXHAUST GAS EDUCTOR SYSTEM M.S. Thesis
Dennis Leo Ryan, III Mar. 1981 167 p refs
(AD-A104072) Avail: NTIS HC A08/MF A01 CSCL 21/2

Cold flow tests of a four nozzle eductor system evaluating the flow characteristics of several mixing stack configurations are presented. Flow visualization was used to determine the flow pattern in the stack. The results of the visualization runs were then used to modify the mixing stack geometry. The eductor system flow characteristics were evaluated in terms of non-dimensional parameters governing the flow phenomena from a one dimensional analysis of a simple eductor system. The eductor system's pumping capacity was improved over that of the previously tested unmodified mixing stack. Author

N82-13388# Texas Univ. at Arlington. Dept. of Aerospace Engineering and Engineering Mechanics.
THE TRANSONIC FLOW FIELD FOR A FLUIDIC-GENERATOR FUZE ASSEMBLY
John J. Bertin, Timothy E. Hayden, and Richard L. Goodyear Adelphi, Md. Harry Diamond Labs. May 1981 65 p refs
(Contract DAAK21-80-P-5171)
(AD-A099616; HDL-CR-81-171-1) Avail: NTIS HC A04/MF A01 CSCL 20/4

Static-pressure measurements and Pitot-pressure measurements were obtained for different nose configurations during wind tunnel tests. The test conditions included free-stream Mach numbers from .95 to 1.3 over a range of free-stream densities simulating altitudes from 15,240 m to 21,030 m. The pressure data from these tests were analyzed to describe the internal and the external flow fields. The pressures measured at the inlet hole for the fluidic-generator assembly is in close agreement with that given by the normal shock relations. The experimentally determined pressure ratio decreased as the free-stream Mach number increased for all external orifices from x = 0.030 x sub o to 1.000 x sub o. Since flow through the fluidic-generator assembly is choked by the nozzle centerbody, the mass-flow rate can be correlated in terms of the external flow conditions. Author

N82-13389# Aberdeen Proving Ground, Md.
ELECTRONIC MEASUREMENT OF AIRBLAST OVERPRESSURE Final Report
28 Sep. 1981 27 p refs

(AD-A105379; TOP-4-2-822) Avail: NTIS HC A03/MF A01 CSCL 19/4

The direct-pressure method and the shock wave velocity method for measuring airblast overpressures above 170 dB (1 psi or 6.9 kPa), resulting from detonation of explosives or firing of guns are described. Techniques for calibrating transducers used for measuring airblast overpressure are also considered. Author

N82-13390# United Technologies Research Center, East Hartford, Conn.

FLOW DISTRIBUTION CONTROL CHARACTERISTICS IN MARINE GAS TURBINE WASTE-HEAT RECOVERY SYSTEMS. PHASE 1: FLOW DISTRIBUTION CHARACTERISTICS AND CONTROL IN DIFFUSERS Annual Technical Report, Jul. 1980 - Jul. 1981

Simion C. Kuo and Ho-Tien Shu Aug. 1981 121 p refs

(Contract N00014-80-C-0476; NR Proj. 097-411)

(AD-A104560; UTRC/R81-955200-4) Avail: NTIS HC A06/MF A01

Flow distribution problems have become increasingly important in the design of modern fluid flow and heat transfer systems. Flow distribution characteristics and control of marine gas turbine exhaust flow is studied. Major technical problems associated with nonuniform flow distribution are reviewed and various flow distribution control methods are evaluated. A two dimensional, turbulent flow model is developed for investigating flow distribution characteristics and diffuser performance. Actual flow distribution data from marine gas turbine exhaust flows is used. A more uniformly distributed flow is obtained by using flow guide vanes combined with flow injection, and an improvement of approximately 20 to 36 percentage points in diffuser efficiency is expected depending on the diffuser geometry considered. GRA

N82-13391# R and D Associates, Marina Del Rey, Calif.

MODELING OF TURBULENT MIXING AT DENSITY DISCONTINUITIES IN NONSTEADY COMPRESSIBLE FLOWS Final Report

R. I. Issa Kirtland AFB, N. Mex. AFWL Sep. 1981 35 p refs

(Contract F29601-78-C-0006; AF Proj. 8809)

(AD-A105564; RDA-TR-107605-001) Avail: NTIS HC A03/MF A01 CSCL 20/4

This document describes a theoretical modeling of turbulent mixing at density discontinuities in nonsteady compressible flows. It is shown that when density and pressure gradients are large and have opposite signs (e.g., near the combustion products/air contact surface in blast waves driven by high-explosive sources), flow perturbations will be amplified, leading to local turbulent mixing. The applicability of using a turbulence model to simulate this process is examined. The conservation laws (for mass, momentum, energy and species) are presented in mass-averaged form, the k-epsilon model of turbulence is applied. The relevant term for the generation of turbulent kinetic energy, the term of dominant importance in this problem, is derived by two independent approaches. This generation term is driven by gradients of pressure and density normal to the interface between the high-explosive products of combustion and the shocked air, and not by shear. The present work is thought to represent the first description of a turbulence model for flows driven by such normal gradients. Author (GRA)

N82-13392# Foster-Miller Associates, Inc., Waltham, Mass.

DESIGN AND DEVELOPMENT OF A RECIPROCATING LOW-TEMPERATURE FREON EXPANDER

S. J. Hynek, A. C. Harvey, R. L. Demler, D. H. Walker, and H. H. Fuller 1981 17 p Presented at the Inter-Soc. Energy Conversion Eng. Conf., Atlanta, 9-14 Aug. 1981

(Contract W-7405-eng-26)

(DE81-028609; CONF-810812-34) Avail: NTIS HC A02/MF A01

The design and development of a 20-ton refrigeration system to be powered by 140 F waste hot water is described. The system consists of a Rankine cycle driving a reverse-Rankine cycle, integrated in that they share a common working fluid, a common condenser, and a common crankcase housing the expander and compressor. A reciprocating single-acting counterflow expander provides a combination of high efficiency in the desired capacity range, modularity, and adaptability to existing compressors. Because the temperatures and pressures of the Rankine cycle fell within the design envelope of a standard refrigeration compressor, the compressor and expander could be housed within the same crankcase by converting some of the compressor cylinders to expander cylinders by replacing the cylinder heads. DOE

N82-13393# Los Alamos Scientific Lab., N. Mex.

LAGRANGIAN FLUID DYNAMICS USING THE VORONOI-DELAUNAY MESH

John K. Dukowicz 1981 30 p refs Presented at the Intern. Conf. on Numerical Methods for Coupled Problems, Swansea, England, Sep. 1981

(Contract W-7405-eng-36)

(LA-UR-81-1421; CONF-810916-1) Avail: NTIS HC A03/MF A01

A Lagrangian technique for numerical fluid dynamics is described which makes use of the Voronoi mesh to efficiently locate new neighbors, and it uses the dual (Delaunay) triangulation to define computational cells. This removes all topological restrictions and facilitates the solution of problems containing interfaces and multiple materials. To improve computational accuracy a mesh smoothing procedure is employed. DOE

N82-13394# Los Alamos Scientific Lab., N. Mex.

RAYLEIGH-TAYLOR STABILITY FOR A SHOCK WAVE-DENSITY DISCONTINUITY INTERACTION

Gary S. Fraley 1981 32 p Presented at the Topical Conf. on Symmetry Aspects of Inertial Fusion Implosions, Washington, D.C., 27 May 1981 Submitted for publication

(Contract W-7405-eng-36)

(DE81-028707; LA-UR-81-2263; CONF-810576-3) Avail: NTIS HC A03/MF A01

The analytic solution for perturbation growth of a shock wave striking a density discontinuity in an inviscid fluid is investigated. The Laplace transform of the solution results in a functional equation, which has a simple solution for weak shock waves. The solution for strong shock waves may be given by a power series. The four independent parameters of the solution are the gamma values on each side of the material interface, the density ratio at the interface, and the shock strength. The asymptotic behavior (for large distances and times) of the perturbation velocity is given. The asymptotic value is given by a constant term and a number of slowly decaying discreet frequencies. The asymptotic velocity at the interface is tabulated for representative values of the independent parameters. For weak shocks the solution is compared with results for an incompressible fluid. The range of density ratios with possible zero asymptotic velocities is given. DOE

N82-13395# California Univ., Livermore. Lawrence Livermore Lab.

FORMULAS FOR ONE-DIMENSIONAL LOCAL PROPERTIES FOR MOLECULAR-DYNAMICS SIMULATIONS OF SHOCK WAVES

R. J. Hardy 8 Jan. 1981 14 p refs

(Contract W-7405-eng-48)

(DE82-000906; UCRL-52972) Avail: NTIS HC A02/MF A01

Formulas are derived for the mass, momentum, and energy densities, the xx component of the pressure tensor P to the xx power, and the x component of the heat flux Q to the x power. The formulas relate these local properties to the masses, positions, and velocities of the constituent particles making up the system and are in a usable form for molecular-dynamics simulations without approximation. The formulas for P to the xx power and Q to the x power avoid the infinite series found in the formulas of Irving and Kirkwood. DOE

N82-13396# Technische Universitaet, Munich (West Germany). Inst. fuer Luft- und Raumfahrt.

INFLUENCE OF WALL ROUGHNESS, ADVERSE PRESSURE GRADIENT AND HEAT TRANSFER ON WALL SHEAR STRESS MEASUREMENTS WITH PRESTON TUBES

Wolfgang Nitsche and Christoph Haberland 1980 45 p refs In GERMAN; ENGLISH summary

(ILR-50; ISSN-0341-0587; ISBN-3-7983-0735-0) Avail: NTIS HC A03/MF A01

Correction functions to the Preston tube calibration curve,

accounting for wall roughness, adverse pressure gradient, and heat transfer, were derived, allowing quantitative measurements of local wall shear stress and skin friction in boundary layer flows modified by these parameters. The correction functions were calculated from analytical boundary layer laws and are compiled in tables. Experiments in rough tubes, on plates with positive pressure gradients, and on heated and cooled surfaces confirm theoretical results. Author (ESA)

N82-13397# Research Inst. of National Defence, Stockholm (Sweden).
TESTING OF A WORK BENCH FOR HANDLING OF EXPLOSIVES IN THE LABORATORY [TEST AV ARBETSBAENK FOER HANTERING AV EXPLOSIVAHEMEN PAA LABORATORIER]
Rune Hank, Kjell Johansson, and Leif Lagman Jan. 1981 32 p refs In SWEDISH
(FOA-C-20393-D1) Avail: NTIS HC A03/MF A01

A prototype work station was developed at which jobs can be carried out with explosives up to 10 gr and deflagrating products up to 50 gr. Tests were made to investigate the consequences of a spontaneous accident during work. Conclusions are: the workbench offers good protection against splinters provided the inside walls are coated with a shock absorber; the carbonate glass should be a minimum of eight mm thick; the risk of burns, except on arms and hands, is very low; the bench withstands the explosion with the given weight of explosives (10 gr); the risk of lesions on the lung are very low, for the operator as well as for somebody nearby. Author (ESA)

N82-13398# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
A SOLUTION OF THE NAVIER-STOKES EQUATIONS BY A MIXED FINITE ELEMENT METHOD Ph.D. Thesis - Paris Univ.
Marc Bredif 1981 135 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-720)
(ONERA-NT-1981-1; ISSN-0078-3781) Avail: NTIS HC A07/MF A01

The numerical treatment of steady state, two-dimensional Navier-Stokes equations in the incompressible case is studied. The approximation method retained is the 'mixed' finite element method, as regards stream function and vortex function. The improvements to this formulation are: possibility of choice of boundary conditions of various types; introduction of a finite element formulation of the stagnation pressure calculation; definition of a corrected formulation with a view to studying laminar flows in the case of large Reynolds numbers. The chosen formulation is discussed theoretically, encompassing the aspects mentioned. A solution algorithm is presented, based on a general conjugate gradient method; numerical results are presented for various cases of viscous, incompressible, laminar flows: (1) in a square cavity; (2) around a circular cylinder; and (3) around a NACA 0018 profile at zero angle of attack for Reynolds numbers up to 5000. Author (ESA)

N82-13399# National Bureau of Standards, Washington, D.C. National Engineering Lab.
AN INITIAL STUDY OF THE APPLICATION OF THE NUMERICAL METHOD OF CHARACTERISTICS TO UNSTEADY FLOW ANALYSIS IN PARTIALLY FILLED GRAVITY DRAINAGE SIZED PIPES
John A. Swaffield Jul. 1981 65 p refs Prepared jointly with Brunel Univ. Sponsored in part by HUD
(PB81-229189; NBSIR-81-2308) Avail: NTIS HC A04/MF A01 CSCL 13C

The application of the numerical method of characteristics to the solution of the differential equations defining unsteady flow in partially filled drainage system sized pipes is outlined. The derivation of the flow equations is presented, together with the necessary boundary equation formulation to represent variable inflow, system discharge and leakage flow past a stationary deposited solid. A computer program, written in FORTRAN, is included, together with typical output, that establishes the applicability of this computational method to unsteady flow analysis in gravity flow drainage systems. Proposals for the extension of the described techniques to the prediction of solid transport and flow attsenuation in long pipes are also presented. GRA

N82-13400 Georgia Inst. of Tech., Atlanta.
HEAT PIPE STARTUP FROM THE SUPERCRITICAL STATE Ph.D. Thesis
Won Soon Chang 1981 212 p
Avail: Univ. Microfilms Order No. 8124285

The transient operation of a Freon-11 heat pipe at temperatures below and near the critical point is studied theoretically and experimentally. A well instrumented test section was designed and fabricated. In the heat pipe regimes the device operated very stably under transient and steady conditions. All inside temperatures in the capillary structure and the vapor space were almost uniform (within 1 K). When high heat load and coolant temperature were applied to the heat pipe, very large temperature gradients occurred throughout, internally and externally. Part of the evaporator was eventually dried out and with more thermal loading the whole capillary structure of the evaporator was dried. The internal temperature distribution, thereafter, diverged along the length of the pipe with increased evaporator temperature exceeding the critical and with decreased condenser temperature approaching the sink temperature. Experiments on cooldown from the supercritical state were carried out to determine the rewetting characteristics of the capillary structure. A computational model for predicting the transient operating characteristics of low-temperature heat pipes is presented. To simulate startup from the supercritical state, a simplified cooldown model was developed using bulk fluid movement with phase-change at the liquid front. Dissert. Abstr.

N82-13401 Purdue Univ., Lafayette, Ind.
COMPUTATION OF UNSTEADY TWO-DIMENSIONAL INVISCID FLOW IN TURBOMACHINERY CASCADES Ph.D. Thesis
Mahmoud Mohamed Kemry 1981 313 p
Avail: Univ. Microfilms Order No. 8123664

A numerical technique was developed to solve the governing equations of motion for unsteady two-dimensional inviscid flow in turbomachinery cascades and applied to the analysis of steady transonic flows in turbine cascades with the steady state solution computed as the asymptotic limit in time of the unsteady solution. The physical plane was transformed to a computational plane to eliminate nonuniform mesh intervals and to simplify the application of the boundary conditions. The full method of characteristics was employed for the boundaries in the leading edge region; the reference plane characteristics method was employed for all other boundaries; MacCormack's method was employed for all interior points. Two cases of turbine cascade flows were solved. The first case involved subsonic flow through the cascade. The second case involved subsonic inlet and discharge flows, but with transonic flow over a portion of the cascade passage. Dissert. Abstr.

N82-13402 California Univ., Los Angeles.
NUMERICAL EXPERIMENTS ON TWO-PHASE LIQUID-VAPOR MIST TRANSPORT Ph.D. Thesis
Jin Young Lee 1981 179 p
Avail: Univ. Microfilms Order No. 8122821

A numerical model of vertical two phase flow of liquid drops in vapor was developed for application to the ocean thermal energy conversion (OTEC) cycle which is proposed to avoid the need of unusually large heat exchangers and/or huge turbines. The analysis consists of three major parts. A one dimensional two fluid model was developed that is able to show the effects of thermal nonequilibrium between vapor and drops. The model was extended to account for collision and coalescence among the drops and can be easily adjusted to the variations in the parameters which enter the collisional model. Two dimensional nonlinear coupled partial differential equations are solved by a finite difference shooting method in parallel with Monte Carlo simulation of drop phase behaviors. Results are obtained for the flow with a periodic disturbance of mist density at injection. Numerical experiments with the model show that the practical maximum net lift for OTEC conditions is about 30 m which is significantly lower than the height obtained from an equilibrium flow analysis and from a collisionless two fluid flow analysis. Dissert. Abstr.

N82-13403 Ohio State Univ., Cleveland.
NUMERICAL STUDY OF MULTICELLULAR NATURAL CONVECTION IN VERTICAL CAVITIES Ph.D. Thesis
Yee Lee 1981 142 p
Avail: Univ. Microfilms Order No. 8121818

The structure of the multicellular convection resulting from the hydrodynamic instability of a flow in both a tall vertical rectangular and a tall annular cavity was calculated by finite difference methods. The effects on the flow structure and the average Nusselt number of varying the Prandtl number of the fluid, the aspect ratio of the cavity and the Grashof number were studied. How the curvature of the walls influences the flow patterns in an annulus was also studied. In addition to predicting the right multicellular flow structure at low Prandtl numbers in a rectangular cavity, travelling wave solutions were obtained for water. The results for the flow of a low Prandtl number fluid in an annulus show a multicellular flow structure which drifts upward with a speed which compares well with the experimentally observed value. The heat transfer results for air in tall rectangular cavities have application to double glazed windows and provide a guide to establishing the proper gap width for best insulation. Dissert. Abstr.

N82-13404 Kansas State Univ., Manhattan.
SIMULTANEOUS HEAT AND MASS TRANSFER IN A POROUS MEDIUM Ph.D. Thesis
Hwanghwei Siang 1981 214 p
Avail: Univ. Microfilms Order No. 8122035

Based upon the principle of irreversible thermodynamics, the macroscopic conservation laws of mass, momentum and energy, and equilibrium sorption of the porous concrete system, a set of basic equations for simultaneous mass and heat transfer is developed. An implicit finite difference technique is employed to solve this set of nonlinear partial differential equations. Numerical examples, using the theory developed, are illustrated to deepen the general understanding of the drying, thermal characteristics and related phenomena of hydrated concrete. The developed theoretical model is made nondimensional and an order of magnitude analysis is performed to elucidate the transport phenomenum of heat and mass occurring in a concrete body. In addition to diffusion, both the capillary and evaporation-condensation mechanisms, which are strongly affected by the topology of the porous concrete system, are important in the heat and mass transfer processes. Dissert. Abstr.

N82-13405 Stanford Univ., Calif.
MIXING OF A PASSIVE SCALAR IN ISOTROPIC AND SHEARED HOMOGENEOUS TURBULENCE Ph.D. Thesis
Ebrahim Shirani-Chaharsughi 1981 177 p
Avail: Univ. Microfilms Order No. 8124152

In order to calculate the velocity and passive scalar fields in homogeneous turbulent flows, the three-dimensional, time-dependent equations of motion and the diffusion equation are solved numerically. Isotropic, homogeneous turbulence with decay of a passive scalar, and homogeneous turbulent shear flow with a passive scalar whose mean varies linearly in the spanwise direction were investigated. The solutions were obtained at relatively low Reynolds numbers so that all of the turbulent scales could be resolved without modeling. The numerical simulations were carried out on the ILLIAC-4. The pseudospectral method was used for space differencing and the second-order Adams-Bashforth method for time differencing. Turbulent statistics such as integral length scales, Taylor microscales, Kolmogorov length scale, one and two point correlations of velocity-velocity and velocity-scalar, turbulent Prandtl/Schmidt number, r.m.s. values of velocities, the scalar quantity and pressure, skewness, decay rates, and decay exponents were calculated. Also, one and three dimensional spectra of velocity components and scalar quantity, three dimensional spectra of production, dissipation and transfer terms, pressure, Reynolds stress, and heat flux terms were calculated. Some of the results are compared with the available experimental results, and good agreement is obtained. Dissert. Abstr.

N82-13406 Oregon State Univ., Corvallis.
AN EXPERIMENTAL STUDY OF HEAT TRANSFER TO A HORIZONTAL TUBE IN A LARGE PARTICLE FLUIDIZED BED AT ELEVATED TEMPERATURE Ph.D. Thesis
Alan Herbert George 1981 76 p
Avail: Univ. Microfilms Order No. 8124329

Experimental data for the time-average local heat transfer coefficient to a single horizontal tube in a large particle fluidized bed at elevated temperature, are presented. Refractory particles with surface mean diameter 2.14 mm and 3.23 mm were fluidized by combustion products of propane at bed temperatures of 810 K and 1053 K. The particle sizes are near the largest presently used in pilot plant fluidized bed coal combustors. The superficial gas velocity ranged from that required for minimum fluidization, or slightly packed, to the velocity where slugging first occurred, or the highest velocity air blower capacity would allow. Heat transfer results indicate that a stack of defluidized particles remain on top of the tube at low superficial gas velocities. A very low local heat transfer coefficient was obtained under these conditions. There was less than 10 percent difference in the maximum spatial average heat transfer coefficients for the two particle sizes considered. Dissert. Abstr.

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N82-13407# California Univ., Livermore. Lawrence Livermore Lab.
LOW ENERGY X-RAY SPECTROMETER
Wayne R. Woodruff 5 Jun. 1981 6 p refs Presented at the Topical Conf. on Low Energy X-Ray Diagnostics, Monterey, Calif., 8-10 Jun. 1981
(Contract W-7405-eng-48)
(DE81-025824; UCRL-85684; CONF-810651-3) Avail: NTIS HC A02/MF A01

A subkilovolt spectrometer was produced to permit high-energy-resolution, time-dependent X-ray intensity measurements. The diffracting element is a curved mica crystal. A carbon X-ray mirror that reflects photons is utilized ahead of the diffracting element. The nominal energy range of interest is 800 to 900 eV. Diffracted photons are detected by a gold-surface photoelectric diode and recorded on an oscilloscope. A thin, aluminum light barrier between diffracting crystal and photoelectric diode detector prevents any uv generated on or scattered by the crystal from illuminating the detector. High spectral energy resolution is provided by photocathodes. The spectrometer was calibrated using Ni L sub alpha 1 2 lines and a molybdenum target X-ray tube. For the latter calibration the carbon mirror was replaced by one surfaced with rhodium to raise the cut-off energy to about 3 keV. The carbon mirror reflection dependence on energy and curved mica crystal diffraction efficiency were measured using X-ray machines. DOE

N82-13408# California Univ., Livermore. Lawrence Livermore Lab.
ON-BOARD DATA RECORDER FOR HARD-TARGET WEAPONS
W. A. Niven and M. F. Jaroska 16 Mar. 1981 14 p refs Presented at Fuze Section Ann. Meeting (ADPA), San Diego, 17 Mar. 1981
(Contract W-7405-eng-48)
(DE81-028645; UCRL-85730-Rev-1; CONF-810367-2-Rev-1) Avail: NTIS HC A02/MF A01

A small, rugged, solid state on-board recorder to capture dynamic data for testing hard target penetration weapons is described. A hydrodynamic computer is used to calculate the response of a warhead to typical ship target. DOE

N82-13409# Pacific Northwest Lab., Richland, Wash.
DEVELOPMENT OF THE HIGH-TEMPERATURE REDOX ELECTRODE AND IMPROVED CORROSION RATE METER Interim Report

M. J. Danielson and O. H. Koski Sep. 1981 38 p refs
(Contract DE-AC06-76RL-01830)
(DE82-000933; PNL-3592) Avail: NTIS HC A03/MF A01

The oxidation-reduction (redox) electrode studies at Pacific Northwest Laboratory (PNL) were completed with the examination of the sulfide-sulfate system. This system is extremely reducing, and it was concluded that the redox electrode would still respond to the entry of oxygen even though sulfide is an oxygen getter. The corrosion rate of platinum in oxygenated brine was determined at 2500 C. It was concluded that the mechanism of response to oxygen fits a mixed potential model. Work began on the improved corrosion rate meter (ICR). A potentiostat and programmer were constructed and successfully tested. Corrosion tests were carried out in 250 C brine with and without oxygen, and the ICR response was very good when compared to corrosion rates determined by weight loss. DOE

N82-13411# AEG-Telefunken, Warstein (West Germany). Fachbereich Leistungshalbleiter.
IMAGING SYSTEMS FOR FAST ELECTROPHOTOGRAPHIC PROCESSES Final Report
Manfred Lutz, Bernd Reimer, Guenter Baumann, Hans Scheuermann, Harald Stausberg, and Hubert Walsdorfer Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 160 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-183; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 33.60

Image carriers based on amorphous Se-alloys and inorganic-organic multilayer systems were developed for applications in fast electrophotographic processing. The combination of Se photoconductive layers doped with 0.5% As or up to 15% Te with a strain reducing metallic interlayer on a flexible endless Ni-belt is demonstrated to provide the photographical quality and bending strength required by fast reprography. The addition of Te is shown to significantly extend the spectral sensitivity range. Thin flexible foils and belts can also be made out of multilayered systems using Se-alloys and polyrinylcarbazole. It is expected that it will be possible to extend the spectral sensitivity to the near infrared, thereby opening a new area of applications in communication and information systems. Author (ESA)

N82-13410# Research Inst. of National Defence, Stockholm (Sweden).
FOA 27 CONTROL INSTRUMENTS DATA SYSTEM. CONTROL INSTRUMENTS AND THEIR FUNCTIONS [FOA INSTITUTION 27 MAETDATORSYSTEM. MAETINSTRUMENTEN OCH DERAS FUNKTIONER]
Sven Wahlstroem and Bertil Sandberg Feb. 1981 62 p refs In SWEDISH
(FOA-C-20394-D3) Avail: NTIS HC A04/MF A01

Computerized control posts using analog processing with digital conversion capability are discussed. The functioning of the different instruments, performance, and experience gained after a certain period with the system is reviewed. Topics covered amplifiers, filters, converters, transient recorders, temperature measuring instruments, and signal processing devices.
Author (ESA)

N82-13412# Bureau of Mines, Pittsburgh, Pa.
THREE BUREAU OF MINES OPTICAL DUST PROBES
Kenneth L. Cashdollar, Israel Liebman, and Ronald S. Conti Jun. 1981 72 p refs
(PB81-231441; BM-RI-8542) Avail: NTIS HC A04/MF A01 CSCL 14B

Three types of optical dust probes are designed, built, and tested. The probes measure dust cloud concentrations by the attenuation of light. A single path length probe, a double path length probe, a single path length probe that employs jets of air to keep the windows of the light source and detector free from dust coating are described. The theory of operation and the caibration procedures for the probes are described. GRA

N82-13413# Bureau of Mines, Amarillo, Tex. Helium Operations.
AN APPARATUS AND PROCEDURE FOR CALIBRATING A WATER VAPOR ANALYZER IN THE 0.1- TO 15-PPM RANGE
Harold L. Rhodes Jun. 1981 14 p refs
(PB81-231185; BM-RI-8548) Avail: NTIS HC A02/MF A01 CSCL 14B

This method uses the quantitative chemical reaction of H2O with CaH2, which produces 1 mole of hydrogen for each mole of H2O in the sample. A gas chromatography is then used to determine the concentration of hydrogen in the product. The precision of the H2O analysis is + or - 0.05 ppm at a concentration of 1 ppm. This method is used to calibrate a commercial platinum-phosphorus pentoxide (Pt-P2O5) electrolytic water vapor analyzer that has an improved inlet system and digital voltmeter readout. GRA

N82-13414# National Bureau of Standards, Washington, D.C.
REQUIREMENTS FOR AN EFFECTIVE NATIONAL NONIONIZING RADIATION MEASUREMENT SYSTEM Final Report
Howard E. Clark Jun. 1981 45 p refs
(PB81-223455; NBS-SP-613; LC-81-600070) Avail: NTIS HC A03/MF A01 CSCL 14B

A detailed assessment of the capabilities, limitations, and requirements of the national nonionizing radiation measurement system is provided. The priorities of these measurement requirements are assessed according to their ability to contribute: to the core competence of determining the electric and magnetic fields of a source; or to the associated capabilities for generating and applying reference fields, characterizing sources and reflectors, or recording exposure histories. These measurement capabilities at all frequencies between dc and 300 GHz were examined. GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N82-13415* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LARGE VOLUME MULTIPLE-PATH NUCLEAR PUMPED LASER Patent
Frank Hohl and Russell J. DeYoung, inventors (to NASA) (Miami Univ., Oxford, Ohio) Issued 10 Nov. 1981 4 p Filed 21 May 1979 Supersedes N79-26385 (17 - 17, p 2266)
(NASA-Case-LAR-12592-1; US-Patent-4,300,106; US-Patent-Appl-SN-041141; US-Patent-Class-331-94.5C; US-Patent-Class-331-94.5P; US-Patent-Class-331-94.5D) Avail: US Patent and Trademark Office CSCL 20E

Large volumes of gas are excited by using internal high reflectance mirrors that are arranged so that the optical path crosses back and forth through the excited gaseous medium. By adjusting the external dielectric mirrors of the laser, the number of paths through the laser cavity can be varied. Output powers were obtained that are substantially higher than the output powers of previous nuclear laser systems.
Official Gazette of the U.S. Patent and Trademark Office

N82-13416 Michigan Univ., Ann Arbor.
THREE LASER EXPERIMENTS IN GASES Ph.D. Thesis
Michael Toubert Myers 1981 157 p
Avail: Univ. Microfilms Order No. 8125176

Three laser experiments performed in gases are reported. Four wave degenerate mixing in cesium vapor is described. Its basis in nonlinear optics is explained and a simple set of equations are derived, which predict the resonant behavior, density dependence, and the power dependence of the signal. Inelastic scattering cross sections for the 9D and 10D states of cesium were measured. The observation of cancellation of rotational effects in the intensity of ultraviolet bands of OH are reported. The band oscillator strength for transition in the band of OH was measured and was independent of rotational excitation. This independence is explained in terms of the cancellation of a rotationally induced increase in the Franck-Condon factor by an equivalent decrease in the electronic transition moment.
Dissert. Abstr.

N82-13417 Stanford Univ., Calif.
ATOMIC PAIR PROCESSES AND LASER APPLICATIONS Ph.D. Thesis
George Andrew Zdasiuk 1981 129 p
Avail: Univ. Microfilms Order No. 8124180

Several mechanisms for the emission and absorption of light by atoms and molecules are described. These processes, which are termed pair emission and pair absorption, respectively, enable two colliding atoms (or molecules, ions, etc.) to simultaneously emit or absorb a single quantum of electromagnetic radiation. The photon energy is equal to the sum of the internal energy changes of the colliding partners. The corresponding wavelength is unrelated to the emission or absorption spectrum of the isolated atoms. Explicit expressions are derived for the linear absorption coefficient for pair absorption and the effective Einstein A coefficient for pair emission. Stimulated pair emission and optical gain on pair absorption transitions are also considered. An experiment which demonstrates the use of optically pumped pair absorption transitions in metal vapors for constructing 'pair absorption pumped lasers' is described. This technique may be useful for constructing active optical frequency conversion devices. Dissert. Abstr.

N82-13418 Stanford Univ., Calif.
LASER INDUCED CHARGE TRANSFER COLLISIONS Ph.D. Thesis
Michael Dean Wright 1981 81 p
Avail: Univ. Microfilms Order No. 8124177

Two laser induced charge transfer reactions involving calcium and strontium were studied. In both reactions, a ground state calcium ion collides with a ground state strontium neutral in the presence of a laser field to produce a ground state calcium neutral and an excited strontium ion. The two reactions differ in the final state of the strontium species. The collision cross sections are studied as functions of applied laser frequency and power density. A laser induced charge transfer collisions analysis which follows the Landau-Zener formalism is presented. Dissert. Abstr.

N82-13419 Rochester Univ., N. Y.
INVESTIGATION OF FLUCTUATION PHENOMENA IN DYE LASERS Ph.D. Thesis
Rajarshi Roy 1981 208 p
Avail: Univ. Microfilms Order No. 8124001

The fluctuation phenomena in single mode and two mode dye lasers were studied. A quantum theory of the single mode c.w. dye laser is presented and the connection between the dye laser and the laser with a saturable absorber is examined. The results of photon counting and correlation measurements on the single mode dye laser are discussed. The effect of flow velocity on the photon statistics is also investigated. Photon counting measurements performed on a two mode ring dye laser which verify some of the theoretical predictions are described. Experiments on both the ring dye laser and a two mode standing wave laser are described in which both the average dwell times and their distributions are measured. A comparison of theoretical and experimental results is made. Dissert. Abstr.

N82-13420# Defence Research Establishment Valcartier (Quebec).
LONG-TERM OPERATION OF A SEALED WAVEGUIDE CO SUB 2 LASER
P. Pace and J. Cruickshank Apr. 1981 21 p refs
(AD-A105261; DREV-R-4207/81) Avail: NTIS HC A02/MF A01 CSCL 20/5

A mass spectrometer has been utilized to study the gas composition during operation of a CO2 laser using a BeO waveguide. The results of this study have allowed us to construct sealed waveguide lasers with predicted lifetimes in excess of 7000 h. Author (GRA)

N82-13421# Defence Research Establishment Valcartier (Quebec). Research and Development Branch.
SURFACE FAILURE OF CO2 LASER IRRADIATED GLASS
R. W. MacPherson and J.-C. Anctil Apr. 1981 23 p refs
(AD-A105454; DREV-R-4202/81) Avail: NTIS HC A02/MF A01 CSCL 20/5

The possibility of failure of laser heated glass has important implications in experiments on the thermal shock resistance of materials and in the potential applications of lasers to the machining and heat treating of glass. We describe a method of measuring the damage probability distribution function for laser irradiated glass and develop a model to predict the temperature and stress distributions as a function of time. The experiments and model show that for CO2 laser pulse lengths inferior to 1 ms, the mode of failure is by fracture under tensile stress induced during cooling after heating a thin layer near the surface beyond the annealing point. Author (GRA)

N82-13422# Los Alamos Scientific Lab., N. Mex.
IMPEDANCE-MATCH EXPERIMENTS USING HIGH INTENSITY LASERS
N. C. Holmes, R. J. Trainor, R. A. Anderson, L. R. Veeser, and G. A. Reeves 1981 4 p refs Presented at the Conf. on Shock Waves in Condensed Matter, Menlo Park, Calif., 23-25 Jun. 1981 Prepared in cooperation with California Univ., Lawrence Livermore Lab.
(Contract W-7405-eng-36)
(DE81-025802; LA-UR-81-2257; CONF-810684-43) Avail: NTIS HC A02/MF A01

The results of a series of impedance-match experiments using copper-aluminum targets irradiated using the Janus Laser Facility are discussed. The results are compared to extrapolations of data obtained at lower pressures using impact techniques. The sources of errors are described and evaluated. The potential of lasers for high accuracy equation of state investigations are discussed. DOE

N82-13423# Los Alamos Scientific Lab., N. Mex.
IMPEDANCE-MATCHING EXPERIMENTS USING HIGH-PRESSURE, LASER-DRIVEN SHOCK WAVES
L. R. Veeser, G. A. Reeves, N. C. Holmes, R. J. Trainor, and R. A. Anderson 1981 5 p refs Presented at the AIRAPT Conf. on High Pressure in Res. and Ind., Uppsala, Sweden, Aug. 1981 Prepared in cooperation with California Univ., Lawrence Livermore Lab.
(Contract W-7405-eng-36)
(DE81-028732; LA-UR-81-2367; CONF-810827-4) Avail: NTIS HC A02/MF A01

A high-power laser was used to produce shock waves with pressures of 300 to 700 GPa. A series of impedance-matching experiments on aluminum-copper systems with 10% accuracy indicate several areas in which the experiment can be improved to reduce the errors. Several such improvements are now being made, including upgrading both the laser and recording systems and modifying the target characterization techniques. DOE

N82-13424# Los Alamos Scientific Lab., N. Mex.
SIMPLIFIED EXTENSION OF THE LSI-11 Q-BUS FOR A HIGH ENERGY LASER CONTROL APPLICATION
Leonard Burczyk 1981 7 p Presented at the 24th Midwest Symp. on Circuits and Systems, Albuquerque, N. Mex., 29 Jun. 1981 Prepared jointly with Nelson and Johnson Engineering, Inc.
(Contract W-7405-eng-36)
(DE81-027001; LA-UR-81-2192; CONF-810623-12) Avail: NTIS HC A02/MF A01

Antares, a large, experimental laser fusion facility under construction at Los Alamos National Laboratory in New Mexico, is controlled by a network of PDP-11 minicomputers and micoprocessors. The remote nodes of the Antares control network are based on an LIS-11/2 microcomputer interfaced to an STD Bus. This machine interface or MI forms the intelligent process controller located directly adjacent to the many diverse laser subsystem devices. The STD Bus, linked to the LIS-11/2 microcomputer, offers a standardized, cost effective means for the development of the specialized interface functions required for the high energy laser environment. DOE

N82-13425 Stanford Univ., Calif.
INVERSE CERENKOV INTERACTION BETWEEN RELATIVISTIC ELECTRONS AND LASER LIGHT Ph.D. Thesis
Wayne Dell Kimura 1981 128 p
Avail: Univ. Microfilms Order No. 8124096

An analysis and experimental verification of momentum modulation of relativistic electrons by laser light using the inverse Cerenkov effect is presented. The laser-induced change in particle

momentum; the electron energy density spectrum as a function of the electron and laser beam characteristics; and the dependence of the interaction on the index of refraction are included. A Monte Carlo computer simulation of the interaction process is also given. In the experiment, light at 1.06 micron from a 30 megawatt neodymium yttrium aluminum garnet laser intersected 102 megavolt electrons at an angle of 18 milliradians in hydrogen gas. Possible applications include laser-driven particle accelerators and coherent Cerenkov devices, such as optical klystrons and optical traveling wave tubes. Dissert. Abstr.

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N82-13426 South Carolina Univ., Columbia.
STUDY OF CORRUGATED PLATES Ph.D. Thesis
Chih-Hung Lee 1981 76 p
Avail: Univ. Microfilms Order No. 8123426

A strain energy development of corrugated plates based on material and geometric properties, along with experimental verification of Huber's results, is presented. All deformations are related to the vertical deflection of the mid-plane, yielding a relationship between the stress and the mid-plane displacement which is absent in the Huber model. Based on these assumptions and thin shell theory, the strain energy was expressed in terms of the mid-plane displacement function. The dynamic equations of motion were then derived utilizing the variational energy principle. These equations were then applied to rectangular, simply supported plates with different height to wave length ratios and solved to determine the natural frequencies and mode shapes. The results were dominated by the unexpected second order derivative term, which determined the failure of this theory. The orthotropic plate equation using the coefficients given by Huber was solved to determine the natural frequencies and mode shapes by utilizing a finite element method. Experimentally, the natural frequencies and mode shapes of the corrugated plate specimens have also been established by a sine sweep excitation of the plate. These experiments used magnetic excitation and an acoustic transducer pickup. Reasonably good agreement was shown between the Huber model and the experimental results. Dissert. Abstr.

N82-13427*# Aerojet Nuclear Systems Co., Sacramento, Calif.
LOW-THRUST CHEMICAL PROPULSION SYSTEM PUMP TECHNOLOGY Final Report
R. L. Sabiers and A. Siebenhaar Mar. 1981 201 p refs
(Contract NAS3-21960)
(NASA-CR-165219) Avail: NTIS HC A10/MF A01 CSCL 13K

Candidate pump and driver systems for low thrust cargo orbit transfer vehicle engines which deliver large space structures to geosynchronous equatorial orbit and beyond are evaluated. The pumps operate to 68 atmospheres (1000 psi) discharge pressure and flowrates suited to cryogenic engines using either LOX/methane or LOX/hydrogen propellants in thrust ranges from 445 to 8900 N (100 to 2000 lb F). Analysis of the various pumps and drivers indicate that the low specific speed requirement will make high fluid efficiencies difficult to achieve. As such, multiple stages are required. In addition, all pumps require inducer stages. The most attractive main pumps are the multistage centrifugal pumps. S.L.

N82-13428*# Battelle Columbus Labs., Ohio.
STUDY OF METHODS FOR APPLYING AND ENHANCING TRANSFER FILM COATINGS OF POLYTETRAFLUOROETHYLENE (PTEE) TO SPACE SHUTTLE MAIN ENGINE (SSME) HIGH PRESSURE OXYGEN TURBO PUMP (HPOTP) BEARINGS Final Report
J. W. Kannel, K. F. Dufrane, and F. F. Zugaro 25 Nov. 1981 19 p refs
(Contract NAS8-33576)
(NASA-CR-161916) Avail: NTIS HC A02/MF A01 CSCL 13I

Machines were constructed and evaluated for burnishing polytetrafluoroethylene on balls for use in the high pressure oxygen turbopump (HPOTP). The most positive performance was obtained with single-ball burnishing, but one technique for burnishing three balls simultaneously holds promise. Evaluations of the coatings in a HPOTP bearing of earlier design (employed smaller diameter balls) showed very little life enhancement before high torque and ball and race wear initiated. Other coating techniques, such as molybdenum disulfide combined with PTFE transfer films, hold promise for providing the more durable quantities of solid lubricant needed for the bearings. A.R.H.

N82-13429# California Univ., Livermore. Lawrence Livermore Lab.
WELDING OF AUSTENITIC STAINLESS STEELS FOR LIQUID-HELIUM SERVICE
E. N. C. Dalder Jun. 1981 15 p refs Presented at the Conf. on MHD Magnets, Boston, 10 Mar 1980
(Contract W-7405-eng-48)
(DE81-025602; UCRL-85818; CONF-8003144-1) Avail: NTIS HC A02/MF A01

The 4 K mechanical and metallurgical behavior of austenitic stainless steel weldments is presented, with emphasis on the problems inherent in the production of defect free welds in structures up to 5 inches thick. Austenitic CrNI, CrNIN2, and CrNiMnN2 stainless steels are the most widely used structural materials in superconducting magnets. These materials show useful combinations of toughness, stiffness, and strength at 4K. DOE

N82-13430# Mechanical Technology, Inc., Latham, N. Y.
ASSESSMENT OF ROTOR-BEARING DYNAMICS: A PLANNING STUDY FOR THE UTILITY INDUSTRY Final Report
J. A. Tecza and E. S. Zorzi Aug. 1981 150 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1648-2)
(DE82-900378; EPRI-CS-1990) Avail: NTIS HC A07/MF A01

The current state of the art regarding the rotor bearing analysis of large steam turbine generators, the needs of American utilities regarding rotor vibration problems and the development of an R and D plan to fulfill those needs was reported. The overall goal is to be able to provide utilities with needed analysis tools and techniques to reduce machine downtime and associated outage costs. The need for improved analysis methods, a summary of current American capabilities and practices, the needs of the utility industry in this area which appear most pressing and a plan for addressing them are discussed. DOE

N82-13431# Akron Univ., Ohio.
DEVELOPMENT OF ADVANCED ROTOR-BEARING SYSTEMS FOR FEEDWATER PUMPS, PHASE 2 Final Report
Maurice L. Adams, Jr. and Elemer Makay (Energy Research and Consultants Corp.) Sep. 1981 71 p refs Sponsored in part by EPRI
(EPRI Proj. 1266-7-1)
(DE82-900376; EPRI-CS-2027) Avail: NTIS HC A04/MF A01

Improvements in the reduction of feed pump vibration problems are reported. It is suggested that the right approach to the problem is to devise high damped rotor bearing configurations. Two important components to this approach are: the development of squeeze film dampers for feed pump applications and the search for interstage sealing configurations which provide additional vibration damping at mid span locations between the journal bearings. DOE

N82-13432# Staatliches Forschungsinstitut fuer Geochemie, Bamberg (West Germany).
EXAMINATION OF EARLY WEAR DETECTION IN DIESEL ENGINES BY ENERGY DISPERSIVE RADIOISOTOPE X RAY FLUORESCENCE ANALYSIS [UNTERSUCHUNGEN ZUR SCHADENSFRUEHERKENNUNG BEI DIESELMOTOREN MIT HILFE DER ENERGIEDISPERSIVEN RADIONUKLID-ROENTGENFLUORESZENZANALYSE]
H. Meier, E. Unger, W. Albrecht, N. Geheeb, W. Hecker, U. Tschirwitz, and D. Boesche Bonn Bundesministerium der Verteidigung 1979 152 p refs In GERMAN; ENGLISH summary

Sponsored by Bundesministerium der Verteidigung
(BMVg-FBWT-79-19) Avail: NTIS HC A08/MF A01; DOK-ZENTBw, Bonn DM 40

The application of X-ray spectroscopy for monitoring wear-metal particles in lubricating oils is considered. The principles of an energy dispersive X-ray analytical arrangement consisting of radioistope sources or small, thin target, X-ray tubes for excitation in connection with detection for selection of fluorescent X-rays, are explained. Analytical relationships, basic equations, parameters for optimizing the spectroscope setup, and problems concerning the preparation of oil samples are discussed. Experiments with organometallic compounds as standards show that by using radioisotopes and portable, thin target, X-ray tubes, respectively in combination with solid state detectors, wear metals can be directly analyzed in lubricating oil samples at the 1.5 to 20 ppm level (Fe: 1.4 ppm; Pb: 5.0 ppm; Cr: 2.2 ppm; Ni: 3.6 ppm). After collecting thin layers of wear particles on filters, detection limits at the 0.2 to 1 ppm level (10 ml oil samples) can be obtained. Author (ESA)

N82-13433# Valeo/Societe Anonyme Francaise du Ferodo (France). Direction des Etudes Centrales.
THE INFLUENCE OF HIGH TEMPERATURE ON BRAKING [INFLUENCE DE LA HAUTE TEMPERATURE SUR LE FREINAGE]
Ricco 1981 21 p refs In FRENCH
Avail: NTIS HC A02/MF A01

Temperatures encountered in brakes are cited, and the importance of the temperature factor to the behavior of brake materials is discussed. Macroscopic aspects of diminishing braking torque are described for certain thermic stages, i.e., failures known as 'low point' and 'fading'. The fundamental causes of these failures are analyzed, linking the thermomechanical properties of brake materials (rigidity and internal damping) to the amount of friction and to instantaneous fluctuations in the tangential force of friction. Results show the effect of a transfer film which forms in function of the thermal stage attained, the material composition, and of the nature of the brake surface.
Author (ESA)

N82-13434# Cambridge Univ. (England). Dept. of Engineering.
CYCLIC COMPRESSION, COMBUSTION AND EXPANSION OF A FUEL AND AIR MIXTURE IN A CYLINDER CONTAINING A CATALYST
H. Daneshyar and J. R. Orme 1981 75 p refs
(PB81-232480; CUED/A-THERMO/TR-5) Avail: NTIS HC A04/MF A01 CSCL 13B

The utilization of catalytic ignition and oxidation of a hydrocarbon fuel and air mixture in a four stroke engine was investigated. The effects of the method of aspiration, the cylinder-head design, the catalyst quality and the design of the catalyst mounting structure upon the performance of the engine with specific attention to cylinder pressure diagrams are ellucidated. High speed color photography was employed to provide a recording of the visual observations of the combustion phenomenon present in the cylinder. Measurements of the levels of emissions of carbon monoxide, carbon dioxide, low hydrocarbons and nitric oxide by the infra-red method were made. Interest was centered upon the ability of the engine to operate using very lean air fuel ratios precluded by spark ignition which is advantageous from the viewpoint of emission levels of carbon monoxide, hydrocarbons and nitric oxide. GRA

N82-13435# Department of Energy, Bartlesville, Okla.
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, THIRD SERIES: 1977 CHRYSLER 318 CID (5.2L), 2V Interim Report
D. E. Koehler, W. F. Marshall, and K. R. Stamper Jun. 1981 60 p
(PB81-233025; DOT-TSC-NHTSA-81-6; BETC/OP-79/2; DOT-HS-805814; Rept-13) Avail: NTIS HC A04/MF A01 CSCL 21G

Dynamometer tests of a 1977 Chrysler 318 CID engine to determine fuel consumption and emissions (hydrocarbon, carbon monoxide, oxides of nitrogen) at steady state engine operating modes were performed. Engine performance data for estimating emissions and fuel economy for varied engine service and duty were obtained. Basic engine characteristic data required as input for engineering calculations involving ground transportation are provided. GRA

N82-13436 Northwestern Univ., Evanston, Ill.
THERMOELASTIC INSTABILITY IN A SEAL-LIKE CONFIGURATION Ph.D. Thesis
Sarveswara Rao Kilaparti 1981 136 p
Avail: Univ. Microfilms Order No. 8124923

Thermoelastic instabilities in rubbing contact was studied for simple contact geometries. Thermoelastic instability in sliding contact is shown to be a consequence of interaction of frictional heating, thermal expansion, conduction of heat from the contact zone and wear. Seal-like configuration is investigated for thermoelastic instabilities. Because of the complexity of the problem, it is studied by breaking into subproblems and solutions are obtained for each case. Effects of material properties on critical speed for instability are presented in nondimensional parameters for general applications. Critical speeds for onset of instability are obtained for nominally flat contacting surfaces in the absence of wear. Nonlinear algebraic equations are obtained in terms of material properties and critical speeds which are solved numerically for different hypothetical values of friction coefficients and properties of materials. Materials contacting their own kind are less prone to instability than materials of different kind. Solutions are obtained for stationary configuration with partially contacting surfaces. Dissert. Abstr.

N82-13437 Wisconsin Univ. - Madison.
ANALYSIS OF MULTICYLINDER IC-ENGINE CRANKSHAFTS WITH HYDRODYNAMIC BEARINGS USING A FINITE ELEMENT-TRANSFER MATRIX APPROACH Ph.D. Thesis
Victor Hugo Mucino-Quintero 1981 224 p
Avail: Univ. Microfilms Order No. 8124230

A new approach for the load-displacement analysis of IC-Engine crankshaft-bearing systems is described. The analytical model incorporates the elastic and inertial properties of the crankshaft, the flexibility of the supports and the hydrodynamic nature of the journal-bearing systems. The structure of the crankshaft is first macrodiscretized into a number of substructures (crankthrows), which are connected in a chain-like manner. Each substructure is subsequently discretized using a finite element formulation, and the synthesis is made through a new finite element-transfer matrix condensation procedure which eliminates the need to arbitrarily designate the master and slave degrees of freedom typically required in most condensation procedures. The hydrodynamic characteristics of the journal-bearing systems are described using an approximate solution of the governing Reynolds Equation, which is applicable to bearings of finite length. The analysis yields the bearing performance coupled to the crankshaft elastic response for a full load cycle. Dissert. Abstr.

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N82-13438# Naval Ocean Systems Center, San Diego, Calif.
FUTURE DIRECTIONS IN NAVY ELECTRONIC SYSTEM RELIABILITY AND SURVIVABILITY
Maniel Vineberg and Reeve D. Peterson Jun. 1981 12 p refs
(AD-A102460; NOSC/TD-448) Avail: NTIS HC A02/MF A01 CSCL 09/5

Primary objectives of a framework for production specifications for Navy electronics systems are outlined. Elements discussed in the design of an intership network are: system's reliability, monitoring, survivability, feasibility, cost constraints, and support facility design. M.D.K.

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N82-13439 Oklahoma State Univ., Stillwater.
A METHOD FOR ACCELERATING CONVERGENCE TO THE SOLUTION OF NONLINEAR STRUCTURAL EQUATIONS BY REDUCING RESIDUAL WORK Ph.D. Thesis
Cline Turner Young, II 1981 86 p
Avail: Univ. Microfilms Order No. 8123478

Two extrapolation techniques for reducing the number of iterations required for convergence to solution by minimizing the work done by the residual loads are presented. The first technique, a linear scalar extrapolation, is a moderately sophisticated form of line search. The second technique, a multiple search extrapolation, has the capability of changing the direction of search without the expense of factoring the global stiffness matrix. It is possible to reduce the number of iterations required to satisfy convergence for nonlinear structural analysis problems using the linear scalar extrapolation. Furthermore, the cost of each iteration is significantly less due to simplification of the determination of the displacements. It is also possible to increase the level of accuracy for a given number of iterations by superimposing the multiple search extrapolation on the linear scalar extrapolation. The net result of this is to allow a greater incremental load step for fixed convergence criteria. Dissert. Abstr.

N82-13440 Lehigh Univ., Bethlehem, Pa.
INELASTIC OVERLOAD ANALYSIS OF CONTINUOUS STEEL MULTI-GIRDER HIGHWAY BRIDGES BY THE FINITE-ELEMENT METHOD Ph.D. Thesis
Jeffrey Craig Hall 1981 202 p
Avail: Univ. Microfilms Order No. 8118835

An analytical technique for predicting the response to overloads of simple span and continuous multigirder beam slab type highway bridge superstructures made of steel beams and reinforced concrete slabs is described. The nonlinear overload response is obtained by using a tangent stiffness solution process. The analysis scheme also employs the displacement based finite element method of structural analysis, where the superstructure is discretized into a series of beam and slab finite elements, and, in addition, where the elements are further subdivided into a series of layers through their depth. The nonlinearities included in the model are: inelastic stress strain relationships, cracking and crushing of concrete, yielding and strain hardening of steel, buckling of beam compression flanges, and buckling of plate girder webs and compression flanges.
Dissert. Abstr.

N82-13441 California Univ., Riverside.
AN EXTENSION TO N DIMENSIONS OF THE VON KARMAN EQUATIONS Ph.D. Thesis
Dave R. Holmes 1981 71 p
Avail: Univ. Microfilms Order No. 8122907

The Von Karman equations for the buckling of a thin elastic plate to three dimensions were extended. The behavior of the three dimensional equations is the same as that of the two dimensional equations with respect to bifurcation from the trivial solution. The equations are extended to n-dimensions and it is shown that their behavior is basically the same as in the two and the three dimensional cases with some minor changes. It is established that an existence theorem for the nonhomogeneous n-dimensional equation does not depend on lambda, the bifurcation parameter, or on the size of the nonhomogeneous term P(x), as long as P(x) is in L2 (omega). Dissert. Abstr.

N82-13442 Purdue Univ., Lafayette, Ind.
MEASURED PAVEMENT RESPONSE TO TRANSIENT AIRCRAFT LOADINGS Ph.D. Thesis
Thomas Dale White 1981 243 p
Avail: Univ. Microfilms Order No. 8123723

Pavement deformation response to aircraft traffic was studied. Linear variable differential transducers (LVDT's) were installed in an active taxiway. The LVDT's were attached to reference rods anchored at 16, 36, 120, and 209 in. Basic pavement responses, information on how pavement layers accommodate dynamic loads, as well as data to compare vertical deformations predicted by a theoretical model were examined. A finite difference solution was used to predict pavement temperatures. The solution is shown to have limited application for predicting pavement temperatures. The pavement response phenomena reported are significant. They expose pavement responses that have been minimized in past research but must now be considered. Current theoretical models used in pavement analysis or design are limited in predicting pavement response phenomena. They do not represent the observed compression and extension in a pavement under and away from actual aircraft loads.
Dissert. Abstr.

N82-13443 Purdue Univ., Lafayette, Ind.
AN EXPERIMENTAL STUDY OF A REINFORCED CONCRETE FOLDED PLATE STRUCTURE WITH EDGE BEAMS Ph.D. Thesis
Musa Rahmoun Resheidat 1981 287 p
Avail: Univ. Microfilms Order No. 8123695

An experimental reinforced concrete folded plate structure with edge beams was studied. The influence of edge beams on the structural response is given specific attention. Two models, alike in every respect except for quantity and arrangement of the steel reinforcement are developd and tested. The two reinforcement models designed utilizing the results of an 'exact' linear-elastic analysis method and a slightly modified system based on the same analytical results augmented by limited allowances for traction redistribution at incipient failure. The results of the exact linear-elastic method of analysis provided the basis for a safe, but conservative, design and accurate predictions of structural response for loads in the service load range. Both models failed at load levels well in excess of that required by contemporary strength design criteria. The experimental results indicate that edge beams significantly increased the stiffness of the structure and its load-carrying capacity. Dissert. Abstr.

N82-13444 Purdue Univ., Lafayette, Ind.
ANALYSIS OF STEEL BEAM-TO-COLUMN MOMENT CONNECTIONS Ph.D. Thesis
Kirit Vallabhbhai Patel 1981 212 p
Avail: Univ. Microfilms Order No. 8123688

A study of both beam-to-column flange connections as well as web connections was carried out. Results of tests were used as a bench mark to validate the analytical procedure. An analytical procedure involved modelling of connection using finite element technique for predicting the behavior of the connection. In case of flange moment connections, an analytical procedure was developed to predict the overall behavior of the connections. Calibration of the finite element model of bolted joint was carried out using pilot test on the same joint to justify the model. Analysis results of load-deflection behavior, the stress distribution in the panel zone, and spread of yield zones at different stages of loading were compared with test results. It is shown that the connection behavior can be predicted analytically. In case of web moment connections, the flange connection plate area is analyzed with the help of nonlinear finite element method taking suitable free body out of the connection semblage.
Dissert. Abstr.

N82-13445 Stanford Univ., Calif.
A CONTINUUM MODEL FOR FRICTION WITH APPLICATIONS IN METAL FORMING PLASTICITY Ph.D. Thesis
Ibrahim Mahdi AL-Khattat 1981 168 p
Avail: Univ. Microfilms Order No. 8124028

A unified model for the mechanics of generalized friction and a rational treatment of the general solid contact problem in mechanics are developed. A local surface 'strength measure' in terms of geometry-independent limiting shear stress is recognized as the natural measure of generalized friction. An experimental procedure is proposed to determine this measure under controlled levels of uniform loading, temperature, surface roughness and texture, and interface motion, leading to a physically sound basis for standardized tests to measure the frictional properties of solid surfaces, the mechanical properties of lubricants, and the strength properties of adhesives. The physical and operational

drawbacks of the Coulomb friction law are discussed and a new formulation of the elastic, viscoelastic, or elastic-plastic discretized boundary value problem involving friction is proposed. At every point of the interface, the boundary conditons are explicitly prescribed either as displacement or traction increments, resulting in a symmetric stiffness matrix in the finite element formulation. Implementation of the proposed frictional model in the increment analysis determines a discretized approximation to the complete state of stress and displacement everywhere on a solid contact surface at every stage of deformation. Three problems in metal forming plasticity are solved with the aid of the frictional model. Dissert. Abstr.

N82-13446# Army Armament Research and Development Command, Watervliet, N. Y.

MOMENT-STRAIN RELATIONSHIPS IN ELASTIC-PLASTIC BENDING OF BEAMS

R. V. Milligan Jun. 1981 30 p
(DA Proj. 1L1-62105-AH-84)
(AD-A101722; ARLCB-TR-81025) Avail: NTIS HC A03/MF A01 CSCL 20/11

Bending moment versus depth of elastic plastic interface for both rectangular, tubular, and solid circular beams were developed. Expressions for strain as a function of geometry and depth of elastic plastic interface for each type of cross section are derived. Strain singularity occurring as the elastic plastic interface approaches the neutral axis is pointed out. The assumption that 'planes remain plane' is examined. The basis for determining residual or permanent strains and expressions for their calculation are given. Author

N82-13447# Ballistic Research Labs., Aberdeen Proving Ground, Md.

NONLINEAR WAVES IN RODS

Thomas W. Wright May 1981 44 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A101333; ARBRL-TR-02324) Avail: NTIS HC A03/MF A01 CSCL 20/11

A one dimensional continuum theory with one internal, scalar variable to be used for modeling a solid rod with longitudinal waves is discussed. Rods are simple structures that are often regarded as one dimensional continua, but because of finite transverse dimensions, propagating waves are subject to dispersion, which may mask other effects. The material is assumed to be homogeneous, isotropic, and hyperelastic. The linear theory is reviewed to exhibit the multiple wave hierarchy that exists in a rod; expansion and scaling techniques are used in the fully nonlinear case to examine the main pulse; steady nonlinear waves are examined and it is found that both solitary waves and periodic waves do exist. Results are compared to the wave solutions from the most elementary one dimensional nonlinear theory for rods. Author

N82-13448# Dayton Univ., Ohio.

MAGNA: A FINITE ELEMENT PROGRAM FOR THE MATERIALLY AND GEOMETRICALLY NONLINEAR ANALYSIS OF THREE-DIMENSIONAL STRUCTURES SUBJECTED TO STATIC AND TRANSIENT LOADING Interim Report, Mar. - Sep. 1980

Robert A. Brockman Wright-Patterson AFB, Ohio AFWAL Jan. 1981 513 p refs
(Contract F33615-80-C-3403; AF Proj. 2402)
(AD-A099454; UDR-TR-80-107; AFWAL-TR-80-3152) Avail: NTIS HC A22/MF A01 CSCL 20/11

A finite element program MAGNA (materially and geometrically nonlinear analysis), developed for nonlinear static and dynamic analysis of complex three-dimensional structures, is described. This program is applicable to large structural response problems involving bars, membrane, plates, shells, and three-dimensional solids, experiencing large displacements, finite strains, large rotating, and plastic deformation. The theoretical basis of MAGNA and numerical procedures employed are described in detail. Sample analyses are presented. Instructions are provided for operating the program, modifying storage capacity, preparing input data, estimating computer run times, and interpreting the output. Computer graphics utilities available for the display of input data and analysis results are also described. Author (GRA)

N82-13449# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.

HYDRODYNAMIC COMPUTATIONS OF PRESSURES GENERATED BY STEAM PIPE RUPTURE Final Report, 6 Mar. 1978 - 30 Sep. 1978

D. L. Lehto and J. M. Ward 23 Feb. 1981 55 p refs
(Contract NRC-03-78-148)
(AD-A102046; NSWC/TR-80-229) Avail: NTIS HC A04/MF A01 CSCL 20/11

Calculations were made to determine the pressure loads generated by the impact of steam jets from a broken process pipe upon the inner wall of a surrounding concentric guard pipe. Longitudinal and circumferential breaks were considered, with various guard pipe diameters. The data obtained can be used in designing guard pipes for high-pressure steam process pipes. Circumferential and longitudinal 12.7 mm (0.5 in) and 50.8 mm (2.0 in) wide breaks in a 0.914 m (36 in) outside diameter process pipe carrying 8.3 MPa (1200 psia) process pipe and the guard pipe ranged from 12.7 mm (0.5 in) to 152.4 mm (6 in). The entire flow fields, including shock waves, were calculated with a two-dimensional hydrocode. The main loading on the guard pipe was determined to be the steady-flow pressure generated subsequent to the process pipe rupture. This pressure drops rapidly as the pipe spacing is increased, so from the standpoint of steam jets, pipe spacings of several inches are desirable. N.W.

N82-13450# SRI International Corp., Menlo Park, Calif.

LARGE AMPLITUDE COMPRESSION AND SHEAR WAVE PROPAGATION IN IMPACT-LOADED PMMA Final Report, 1 Jul. 1978 - 30 Sep. 1981

Y. M. Gupta Oct. 1981 7 p
(Contract DAAG29-78-C-0030)
(AD-A105953; ARO-15513.2-E) Avail: NTIS HC A02/MF A01 CSCL 20/11

The goal of this research was to develop an improved understanding of the high strain rate material response of polymers by studying the propagation of large-amplitude, one-dimensional compression and shear waves in impact-loaded polymethyl methacrylate (PMMA). Experimental techniques were designed and developed to permit measurement of large-amplitude shear waves. Measurements were made of the shear particle velocity at the impact surface and in the sample interior. The measurement of shear wave velocities permitted the first determination of the shear and bulk modulus in the shocked state. The shear wave profiles measured at several gage locations in the sample were integrated (using a Lagrangian analysis for compression and shear waves) to provide shear stress-strain response in the shocked state. These results are the first of their kind and provide an important constraint on the shear (or deviator) response of the material. Author (GRA)

N82-13451# California Univ., Los Angeles. School of Engineering and Applied Science.

ASYMMETRIC STRESS AND FAILURE ANALYSIS

J. Yu and R. Westmann [1981] 6 p refs
(Contract DE-AT03-76SF-74016)
(DE81-026842; DOE/SF-74016/T3) Avail: NTIS HC A02/MF A01

The cladding failure due to asymmetric structural response of the fuel cell is studied. The fracture and cracking patterns prior to the development of fuel-cladding contact and the forces in the cladding after fuel-cladding contact has been made are investigated. DOE

N82-13452# Sandia Labs., Albuquerque, N. Mex.

APPLICATION OF THE THEORY OF LINEAR ELASTIC MATERIALS WITH VOIDS

Stephen C. Cowin, Jaco W. Nunziato, and Pratap Puri (New Orleans Univ.) 1981 12 p refs Presented at the 4th Intern. Conf. on Continuum Models of Discrete Systems, Stockholm, 29 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-027903; SAND-81-1139C; CONF-8106133-1) Avail: NTIS HC A02/MF A01

The linear theory of elastic materials with voids is summarized and some applications are sketched. The theory differs from classical linear elasticity in that the volume fraction

corresponding to the void volume is taken as an independent kinematic variable. The following applications of the theory are described briefly: response to homogeneous deformations, inflation of a cylinder and sphere due to internal pressure, pure bending of a beam, and small amplitude acoustic waves. In each of these applications, the change in the void volume induced by the deformation is determined. DOE

N82-13453# Sandia Labs., Albuquerque, N. Mex.
ANALYSIS OF STRESS DROP IN MULTISTAGE CREEP EXPERIMENTS: PREDICTIONS OF EXPONENTIAL CREEP LAW
W. Herrmann and H. S. Lauson Aug. 1981 22 p refs
(Contract DE-AC04-76DP-00789)
(DE81-029279; SAND-81-1612) Avail: NTIS HC A02/MF A01

Multistage creep experiments in which the stress or temperature are increased stepwise were successfully analyzed using an exponential transient creep law. The analysis is generalized and implemented for an arbitrary number of stages including stress and temperature drops. Under certain conditions the simple exponential creep law, evaluated from data for stages following increases in stress and temperature, predicts inverted transients for stages following decreases in stress or temperature. Comparisons of predictions with limited experimental data suggest that the simple exponential creep law is inadequate, and that separate hardening and recovery processes need to be modeled to handle stress or temperature drops. DOE

N82-13454# Los Alamos Scientific Lab., N. Mex.
PRESSURE MEASUREMENTS OF NON-PLANAR STRESS WAVES
G. H. Carlson and J. A. Charest (Dynasen, Inc.) 1981 24 p refs Presented at the 1st Symp. on Gages and Piezoresistive Mater., Archon, France, 29 Sep. - 1 Oct. 1981
(Contract W-7405-eng-36)
(DE81-028729; LA-UR-81-2343; CONF-810931-1) Avail: NTIS HC A02/MF A01

Nonplanar stress wave pressure measurement using thin piezoresistive gages requires correcting for induced strain parallel to the sensing elements. A dual element gage is developed that permits such measurements. Manganin is sensitive to parallel and perpendicular to the sensing element. Constantan is change is sensitive to stress parallel to the sensing element. The change in resistance in the Constantan element is used to correct for the strain effect parallel to the Manganin element axis. The Manganin-Constantan dual element gage is used in the differential recording mode to yield pressure. The gage is a strain compensating gage in this mode. DOE

N82-13455# Hamburg Univ. (West Germany). Inst. fuer Schiffbau.
BEHAVIOR OF PLANE PANELS IN SHIP STRUCTURES WITH LOCAL INITIAL DEFLECTIONS [TRAGFAEHIGKEIT VON E BENEN SCHIFFBAULICHEN FLAECHENTRAGWERKEN MIT OERTLICHEN VORVERFORMUNGEN]
H. Petershagen Bonn Bundesministerium der Verteidigung 1980 156 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung
(BMVg-FBWT-80-18) Avail: NTIS HC A08/MF A01; DOK-ZENTw, Bonn DM 40

The influence of deformations resulting from welding stresses on the carrying capacity of plate panels were studied theoretically and experimentally. Buckling tests were made with two longitudinally and transversally stiffened plates under longitudinal compression combined with inplane shear and lateral load. The test results are compared with the predictions from nonlinear plate theory. The theoretical stress analysis is based on a model: one involving application of the energy method, and a model using finite element techniques. Results show that the initial deformations affined to the buckling modes have the greatest influence. The finite element idealizations do not lead to improvements as compared to the results from the energy method. Author (ESA)

N82-13456# Technical Research Centre of Finland, Espoo. Lab. of Structural Engineering.
THIN-WALLED STRUCTURES. TRAPEZOIDAL SHEET BENDING AND UNDER SHEAR STRESSES
Lars-Henrik Heselius Jul. 1980 145 p refs In FINNISH; ENGLISH summary
(VTT-11; ISBN-951-38-1123-0; ISSN-0357-7031) Avail: NTIS HC A07/MF A01

The bending capacity of trapezoidal sheets provided with intermediate stiffeners, and the support reaction capacity with oversized support lengths were determined. A model which allows use of wide supports in the dimensioning of continuous trapezoidal sheets is presented. The effect of cylindrical curvature of the planes of trapezoidal sheets on the bending capacity was examined. The stiffening capacity of the frame of the trapezoidal sheets in different failures cases is reported. The effect of increasing bending capacity of the longitudinal joint in a trapezoidal sheet slab was also tested. The interaction of local and global buckling of columns constructed of thin walled rectangular hollow sections and the bending capacity of light profiled beams with both flanges continuously braced are analyzed. Author (ESA)

N82-13457# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
STRUCTURAL DYNAMICS: MODIFIED CALCULATIONS
G. Hornung and H. Roehrle Bonn Bundesministerium der Verteidigung 1981 83 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung
(BMVg-FBWT-81-1) Avail: NTIS HC A05/MF A01; DOK-ZENTBw, Bonn DM 30

Calculation methods which give natural and harmonically excited vibrations of modified structures, using the results of the original systems, are presented and tested. Most of the methods are based on a linear approximation, i.e., the individual terms of the equations of motion are subdivided into those of the original system and into corresponding difference terms whose products are subsequently neglected. Tests are carried out for simple models as well as for three-dimensionally idealized wing and aircraft structures. Concerning natural vibrations, it is difficult to estimate the achieved accuracy without knowing the exact results. The applied methods are Wielandt iteration and subspace iteration. Using the original natural modes as starting vectors leads to a considerable reduction in computation cost, even with severe modifications. Application of the linear approximation is shown for the reduction of the number of degrees of freedom, which precedes dynamic analysis. Author (ESA)

N82-13458# Cambridge Univ. (England). Dept. of Engineering.
RESIDUAL STRESS AND DEFORMATION IN CIRCUMFERENTIAL PIPE-JOINT WELDS
A. A. Scaramangas 1980 96 p refs
(PB81-232464; CUED/D-STRUCT/TR-87-1980; ISSN-0309-7447) Avail: NTIS HC A05/MF A01 CSCL 13E

A simplified model for the analysis of a single-pass circumferential pipe-joint weld is presented. It is deduced that the hoop shrinkage (tendon) force has essentially the same value as that for a similar weld in flat plate. Limited experimental evidence reported by other workers is consistent with the proposition that the hoop stress in the weld region is at tensile yield although its magnitude locally is determined by the material yield surface and the bending compressive axial stresses due to radial pipe deformation. GRA

N82-13459 Nebraska Univ. - Lincoln.
AN INTEGRAL EQUATION METHOD FOR CUTOUT PROBLEMS IN SHELLS Ph.D. Thesis
Richard Lloyd Grover 1981 114 p
Avail: Univ. Microfilms Order No. 8124512

A method is described for the determination of the state of stress in a shallow shell with a single curvilinear hole. A system of two coupled integral equations is obtained using the Green's function method. Each of these equations includes a contour integral associated with the corresponding plate solution and a surface integral which yields the correction to the plate solution. A complex variable method is presented for the derivation of the Green's functions appearing in the integral equations. These functions are the Green's functions for plane stress and plate bending which satisfy the boundary conditions on the hole which eliminate the unknown boundary values from the contour integrals. Although the method is applicable to holes of arbitrary

shape, the case of a circular hole with tractions prescribed on the edge is shown as an example. The formulation yields the direct solution to plate problems by simple contour integration. Closed form solutions are obtained for three selected plate problems. Dissert. Abstr.

N82-13460 California Univ., Los Angeles.
DYNAMIC ANALYSIS OF FLEXIBLE SPATIAL MECHANISMS AND ROBOTIC MANIPULATORS Ph.D. Thesis
Wallace Hikaru Sunada 1981 313 p
Avail: Univ. Microfilms Order No. 8122862

The distributed flexibility and mass of geometrically complex links in high speed industrial machines and manipulators is described using the 4 x 4 matrix approach and is fully compatible with existing commercially available finite element structural analysis programs such as NASTRAN STARDYNE, or SAP. These programs, while unable to analyze high speed, flexible spatial mechanisms, are effectively used as link preprocessors to a mechanism analysis program. A procedure called component mode synthesis was used to reduce the dynamic degrees of freedom to a size suitable for incorporation into a mechanism program. The SALEM computer program for the spatial analysis of linkages with plastic members combines the finite element description of the link flexibility and mass with the 4 x 4 matrix description of the mechanism kinematics. The method is applied to three representative mechanisms, a co-planar four par linkage with flexible offset coupler and output links, a spatial slider crank mechanism with a flexible, helical coil coupler link, and, finally an industrial robotic manipulator system. Dissert. Abstr.

N82-13461 Tennessee Univ., Knoxville.
EFFECTS OF RESTRAINED THERMAL MOVEMENT IN A CONTINUOUS, PRESTRESSED CONCRETE BRIDGE WITHOUT INTERIOR EXPANSION JOINTS Ph.D. Thesis
Ramzi Behnam Abdul-Ahad 1981 162 p
Avail: Univ. Microfilms Order No. 8123138

A theoretical method for calculating thermal stresses and movements in continuous bridge structures was developed. Experimental data obtained from strain gages and thermocouples were conducted and field data obtained with those predicted from theory were compared. The nonlinear distribution of temperature throughout the depth of superstructure was divided into two parts: a linear temperature distribution which causes deformation; and nonlinear which results in self equilibrating stresses which do not cause any deformation of the structure. It is shown that the thermal stresses are typically greater than dead load stresses, and that the movements of the deck are proportional to middeck temperature. Dissert. Abstr.

N82-13462 Purdue Univ., Lafayette, Ind.
ELASTIC-PLASTIC-FRACTURE ANALYSIS OF CONCRETE STRUCTURES Ph.D. Thesis
Shyi-Shing Hsieh 1981 146 p
Avail: Univ. Microfilms Order No. 8123654

Elastic-Plastic Fracture model and solution methods for finite element analysis to study progressive failures of plain concrete structures under short term triaxial loading conditions were studied. For the material modeling, a four parameter fractural (or yielding) criterion was proposed. Three different types of concrete fracture modes were considered. All the matrix formulations of the constitutive relationships were derived and their implementation for numerical analysis was illustrated by three sample problems using nonlinear finite element methods. To obtain nonlinear finite element solutions, some numerical schemes were introduced and validated. The solution techniques and the material model were coded in two computer programs. The program EFCP was developed for the study of crack propagation procedures, and the program EL T2D6 was developed in subroutine form to integrate with a general structural nonlinear finite element program. Dissert. Abstr.

N82-13463 Northwestern Univ., Evanston, Ill.
DYNAMIC EFFECTS ON FRACTURE OF ELASTIC - PLASTIC MATERIALS Ph.D. Thesis
Victor Arkady Ounayevsky 1981 115 p
Avail: Univ. Microfilms Order No. 8124877

In terms of a steady-state formulation, mode 1 and mode 3 crack propagation were considered. For the elastic perfectly-plastic material it was found that the dynamic effects give rise to a crack-tip zone in the immediate vicinity of the rapidly propagating crack-tip. In this zone, which shrinks on the crack tip in the quasi-static limit, the fields can be described by a combination of a centered fan field and a uniform field. The transition from dynamic to quasi-static conditions for the mode 3 case was studied in the plane of crack. Because of the effect of the crack-tip zone there is a significant difference between the strain fields in the dynamic and quasi-static solutions. Asymptotic expressions (for a small range of the parameter of hardening) of stresses and strains were obtained for the strain-hardening material. The hardening effect results in the appearance of a singular factor whose power tends to zero when the parameter of hardening vanishes. In that case the solution reduces to the one for the elastic perfectly-plastic material.
Dissert. Abstr.

N82-13464 Missouri Univ. -Rolla.
LOAD AND RESISTANCE FACTOR DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS Ph.D. Thesis
Boonsong Supornsilaphachai 1981 265 p
Avail: Univ. Microfilms Order No. 8123579

Design criteria for cold-formed steel structural members was studied. This study included the selection of a probabilistic model, the evaluation of load factors, the calibration of safety indexes for the allowable stress design criteria issued by the American Iron and Steel Institute, and the determination of resistance factors. Based on the safety indexes selected for cold-formed steel structural members and connections, the load and resistance factor design criteria for cold-formed steel were developed by using the first order probabilistic theory and the statistical data on mechanical properties of materials and the test results obtained from previous research. In this method, appropriate load factors and resistance factors are applied to specified loads and nominal resistance to ensure that the limit state is not exceeded. This design method can provide a more uniform overall safety and structural reliability because uncertainties are accounted for.
Dissert. Abstr.

N82-13275# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
THE ROLE OF FATIGUE TESTING
P. R. Edwards *In* AGARD Fatigue Test Methodology Oct. 1981 15 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

N82-13276# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
PLANNING AND ANALYSIS OF A FATIGUE TEST PROGRAMME
D. Schuetz *In* AGARD Fatigue Test Methodology Oct. 1981 22 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

N82-13277# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Werkstoff-Forschung.
FATIGUE TEST MACHINES
H. Nowack *In* AGARD Fatigue Test Methodology Oct. 1981 23 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

N82-13278# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
VARIABLE AMPLITUDE FATIGUE TESTING
D. Schuetz *In* AGARD Fatigue Test Methodology Oct. 1981 31 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

N82-13279# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Werkstoff-Forschung.
ON-LINE COMPUTERS IN FATIGUE TESTING
H. Nowack *In* AGARD Fatigue Test Methodology Oct. 1981 11 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

N82-13282# Royal Aircraft Establishment, Farnborough (England). Materials Dept.
FATIGUE TESTS WITH A CORROSIVE ENVIRONMENT
R. N. Wilson *In* AGARD Fatigue Test Methodology Oct. 1981 20 p refs (For primary document see N82-13274 04-31)
Avail: NTIS HC A12/MF A01

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

N82-13465* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SCANNER Patent
Robert F. Hummer (Santa Barbara Research Center) and Deane T. Upton, inventors (to NASA) (Santa Barbara Research Center) Issued 10 Nov. 1981 12 p Filed 19 May 1975 Supersedes N76-19408 (14 - 10, p 1252) Continuation of abandoned US Patent Appl. SN-583219, filed 30 Sep. 1966 Sponsored by NASA
(NASA-Case-GSC-12032-2; US-Patent-4,300,159; US-Patent-Appl-SN-578700; US-Patent-Appl-SN-583219; US-Patent-Class-358-109; US-Patent-Class-250-235; US-Patent-Class-250-236) Avail: US Patent and Trademark Office CSCL 20F

An aerial vehicle rotating in gyroscopic fashion about one of its axes has an optical system which scans an area below the vehicle in determined relation to vehicle rotation. A sensing device is provided to sense the physical condition of the area of scan and optical means are associated to direct the physical intelligence received from the scan area to the sensing means. Means are provided to incrementally move the optical means through a series of steps to effect sequential line scan of the area being viewed keyed to the rotational rate of the vehicle.
Official Gazette of the U.S. Patent and Trademark Office

N82-13466 Stanford Univ., Calif.
THE OCCURRENCE AND CONTROL OF LAND SUBSIDENCE DUE TO GROUND WATER WITHDRAWAL WITH SPECIAL REFERENCE TO THE SAN JOAQUIN AND SANTA CLARA VALLEYS, CALIFORNIA Ph.D. Thesis
Joseph Fairfield Poland 1981 172 p
Avail: Univ. Microfilms Order No. 8124135

The San Joaquin Valley in California is the area of the most intensive land subsidence in the United States Subsidence which affects 4,200 sq mi (10,875 sq km), reached 28 ft (8 m) in 1969. The total volume of subsidence to 1970 was about 15.5 million acre ft. Surface water imports to subsiding areas reduced ground water extractions and raised the artesian head, causing subsidence rates to decrease. In the Santa Clara Valley, excessive pumping of ground water between 1917 and 1967 caused as much as 180 ft (50 m) of artesian head decline and maximum and subsidence of 13 ft (4 m). A fourfold increase in surface water imports in 5 years achieved a dramatic rise of artesian head -- 70 ft (20 m) in 4 years. Subsidence rates decreased from as much as 1 ft (0.3 m) per year in 1961 to a few humdredths of a foot in 1970. If fluid pressures in the aquifers in a compacting, confined system increased sufficiently to equal or exceed pore pressures in the fine grained sediments, subsidence will stop. Dissert. Abstr.

N82-13467 Wisconsin Univ. - Madison.
REGIONAL HYDROLOGIC MODELS FOR CLIMATOLOGY: AN APPLICATION TO THREE WISCONSIN WATERSHEDS Ph.D. Thesis
Douglas Robison Clark 1981 105 p
Avail: Univ. Microfilms Order No. 8117508

Two hydrologic models were applied to three watersheds in south central Wisconsin (Black Earth Creek, Sugar River, Crawfish River) over a thirty year period (1948-1977). Model parameter values were obtained by calibration of model runoff to observed streamflow. Model storage levels were compared to water table observations in one watershed. The two storage model simulated streamflow just as well as the three-storage model. A flexible parameterization scheme enables the two-storage model to assimilate the additional runoff component generated by the three-storage model. However, the uppermost storage element in the three-storage model provides a useful regional soil moisture indicator not available in the simpler model. The parameters controlling evapotranspiration have the greatest influence on the models' ability to reproduce river runoff and the overall seasonal water balance, followed by the storage capacity parameters. Dissert. Abstr.

N82-13468*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LABORATORY MEASUREMENTS OF PHYSICAL, CHEMICAL, AND OPTICAL CHARACTERISTICS OF LAKE CHICOT SEDIMENT WATERS
William G. Witte, Charles H. Whitlock, J. W. Usry, W. Douglas Morris, and E. A. Gurganus Dec. 1981 30 p refs
(NASA-TP-1941; L-14714) Avail: NTIS HC A03/MF A01 CSCL 08H

Reflectance, chromaticity, diffuse attenuation, beam attenuation, and several other physical and chemical properties were measured for various water mixtures of lake bottom sediment. Mixture concentrations range from 5 ppm to 700 ppm by weight of total suspended solids in filtered deionized tap water. Upwelled reflectance is a nonlinear function of remote sensing wave lengths. Near-infrared wavelengths are useful for monitoring highly turbid waters with sediment concentrations above 100 ppm. It is found that both visible and near infrared wavelengths, beam attenuation correlates well with total suspended solids ranging over two orders of magnitude. E.A.K.

N82-13469*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPOLATING FOR THE LOCATION OF REMOTE SENSOR DATA
Edward F. Puccinelli and Jack Kornfield (NSF) Jul. 1981 23 p refs
(NASA-TM-82169) Avail: NTIS HC A02/MF A01 CSCL 05B

An interpolation algorithm is presented as a practical alternative to common interpolation and approximation methods when applied to the problem of determining the location of remote sensor data. This algorithm is based upon knowledge of the geometry of the problem and is shown to be inherently more accurate than common interpolation schemes which may be applied to all types of data. A practical location problem is used to demonstrate its accuracy and computational cost.
Author

N82-13470*# Environmental Research and Technology, Inc., Concord, Mass.
ANALYSIS OF SOIL MOISTURE EXTRACTION ALGORITHM USING DATA FROM AIRCRAFT EXPERIMENTS Final Report
Hsiao-hua K. Burke and Jean-Hsien Ho Jun. 1981 37 p refs (Contract NAS5-26361)
(NASA-CR-166719; P-A826) Avail: NTIS HC A03/MF A01 CSCL 08M

A soil moisture extraction algorithm is developed using a statistical parameter inversion method. Data sets from two aircraft experiments are utilized for the test. Multifrequency microwave radiometric data surface temperature, and soil moisture information are contained in the data sets. The surface and near surface (< or = 5 cm) soil moisture content can be extracted with accuracy of approximately 5% to 6% for bare fields and fields with grass cover by using L, C, and X band radiometer data.

This technique is used for handling large amounts of remote sensing data from space. S.L.

N82-13471# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
INVESTIGATION OF THE ACOUSTIC EMISSION AND DEFORMATION RESPONSE OF FINITE ICE PLATES
P. C. Xirouchakis and W. F. St.Lawrence (Army Cold Regions Research and Engineering Lab., Hanover, N.H.) Apr. 1981 26 p refs
(DA Proj. 4A1-61102-AT-24)
(AD-A103731; CRREL-81-6) Avail: NTIS HC A03/MF A01 CSCL 08/12

A procedure is described for monitoring the microfracturing activity in ice plates subjected to constant loads. Sample time records of freshwater ice plate deflections as well as corresponding total acoustic emission activities are presented. The linear elastic as well as viscoelastic response for a simply supported rectangular ice plate is given. Suggested future work using the procedure is discussed. Author

N82-13472# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
ON THE BUCKLING FORCE OF FLOATING ICE PLATES
Arnold D. Kerr Jun. 1981 13 p refs
(AD-A103733; CRREL-81-9) Avail: NTIS HC A02/MF A01 CSCL 20/11

The calculation of the largest horizontal force a relatively thin floating ice plate may exert on a structure requires the knowledge of the buckling load for this floating plate. It is shown that, depending on the ratio of the rigidities of the liquid and plate, the post buckling branch may rise or drop away from the bifurcation point. It is also shown that when lift-off of plate from the liquid takes place, the actual buckling load may drop substantially. A floating compressed semi-infinite plate with a straight free edge, assuming that there is no lift-off, is analyzed. It is found that for this case there always exists a buckling load that is lower than p sub cr. It is suggested that the buckling load be determined using the post-buckling equilibrium branch of the plate, taking into consideration the possibility of lift-off of the ice cover from the liquid base. Author

N82-13473# Los Alamos Scientific Lab., N. Mex. Dept. of Meteorology.
SPECTRA OVER COMPLEX TERRAIN
H. A. Panofsky, D. Larko (Research and Data Systems, Inc.), R. Lipschutz (NOAA, Boulder, Colo.), and G. Stone 1981 18 p refs Presented at the 4th U.S. Natl. Conf. on Wind Eng. Res., Seattle, 26-29 Jul. 1981 Submitted for publication
(Contract W-7405-eng-36)
(DE81-028734; LA-UR-81-2380; CONF-810742-1) Avail: NTIS HC A02/MF A01

Spectra were measured over land downwind of a water surface over hilltops escarpments, and over rolling farmland. The following hypotheses are used to explain the differences between these spectra: (1) wavelengths short compared to the fetch over the new terrain, spectral densities are in equilibrium with the new terrain; (2) wavelengths long compared to this fetch, spectral densities remain unchanged if the ground is horizontal. If the flow is over a steep hill, the low frequency structure is modified by distortion of the mean flow, with the longitudinal component losing energy relative to the lateral and vertical components. It is found that vertical velocity spectra contain relatively less low frequency energy than horizontal velocity spectra, energetic vertical velocity fluctuations tend to be in equilibrium with local terrain. DOE

N82-13474# Alaska Univ., Fairbanks. Inst. of Marine Science.
TRANSPORT AND REACTION OF HEAVY METALS IN ALASKAN FJORD ESTUARIES Annual Report, 1 Jul. 1980 - 31 May 1981
D. C. Burrell May 1981 82 p refs
(Contract DE-AT06-76EV-0001)
(DE81-028319; DOE/EV-70001/60) Avail: NTIS HC A05/MF A01

The potential effects of energy related chemical pollution in Alaskan fjords was investigated. The chemical, physical, and biological processes responsible for the transport and reaction of heavy metals in sub arctic estuaries. The physical circulation and mixing processes, the nature and reactions of terrigenous organics and particulate sediment within the mixing zone, and aspects of the basin sediment oxygen, carbon and nutrient budgets in addition to study of individual metals are investigated. Mainly copper, iron and manganese are studied since these provide information on physical-chemical processes common to, or greatly affecting, a much wider range of metals. DOE

N82-13475# Minnesota Univ., Minneapolis. Limnological Research Center.
DEVELOPMENT OF PEATLANDS IN NORTHERN MINNESOTA Technical Progress Report
H. E. Wright, Jr. Sep. 1981 5 p refs
(Contract DE-AC02-80EV-10414)
(DE82-000873; DOE/EV-10414/T1) Avail: NTIS HC A02/MF A01

The extensive peatlands in northern Minnesota, which are considered as an energy resource through the development of a gasification operation were studied. Problems of peat mining, draining, reclamation, economic impact, wildlife, and vegetation are discussed. The history of formation of the major peatlands in northern Minnesota, and their relationship distribution and composition, to the modern and past climate and to the various natural factors and processes prevailing in the region are investigated. The following factors are considered: the formation of vegetation patterns that seem to be unique for North American peatlands, regional differences from east to west that may reflect trends in postglacial climate and forest composition, rates of peat formation in different environmental settings, and the record of atmospheric pollution (industrial contaminations, agricultural dust) that may be contained in short cores of peat. DOE

N82-13476# Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
ANALYSIS OF THE DEVELOPMENT OF SHALLOW GROUNDWATER SUPPLIES BY PUMPING FROM PONDS
Mustafa M. Aral, T. W. Sturm, and J. M. Fulford Feb. 1981 102 p refs
(OWRT Proj. A-089-GA(1))
(PB81-231904; ERC-02-81; W81-04311) Avail: NTIS HC A06/MF A01 CSCL 13B

The use of the shallow aquifer as a direct water source through development of large diameter, shallow wells or ponds was explored. Continued pumping from the principal artesian aquifer in coastal Georgia has led to a general decline of the piezometric surface. With the decline of the groundwater level saline intrudes into freshwater zones. A shallow, unconfirmed aquifer overlays the artesian aquifer and receives surface recharge. A numerical model to study the hydraulics of flow to a pond in an unconfined aquifer is employed. The groundwater hydraulics problem is solved by finite element method for two dimensional pits and axisymmetric ponds in phreatic aquifers for steady state and transient cases. GRA

N82-13477# Alaska Univ., Fairbanks. Inst. of Water Resources.
ALASKA'S WATER RESOURCES PROBLEMS AND RESEARCH NEEDS: INSTITUTE OF WATER RESOURCES, FIVE-YEAR RESEARCH PLAN
Jun. 1980 32 p refs
(PB81-231920) Avail: NTIS HC A03/MF A01 CSCL 13B

A nine point program for water resource development in industrial and urban resource needs is reported. The plan which covers flood plain management, frozen soils, water supply, waste disposal, toxic trace element management, aquatic resource management, and coastal zone management is summarized. GRA

N82-13478# Hawaii Univ. at Manoa, Honolulu. Water Resources Research Center.
FIVE-YEAR HAWAII WATER RESEARCH AGENDA, 1982-1987
Oct. 1980 91 p refs
(PB81-231912; W81-04313) Avail: NTIS HC A05/MF A01 CSCL 13B

The water supply, especially the near overdraft conditions of the basal groundwater aquifers in Hawaii is addressed. The water quality, especially in the coastal areas, identifying proper values for instream uses, such as recreation and aesthetics, and flora and fauna habitats and legislation concerning water allocation are discussed. GRA

N82-13479# Iowa State Water Resources Research Inst., Ames.
FIVE-YEAR WATER RESOURCES RESEARCH PLAN, 1982-1987
Merwin D. Dougal and T. Al Austin Oct. 1980 70 p
(PB81-231938; ISWRRI-116; W81-04315) Avail: NTIS HC A04/MF A01 CSCL 13B

The fracture decrease of water resources in Iowa is discussed. Projected water withdrawal will rise from 3.68 billion gallons per day (1975) to 27.5 billion gallons per day (2020). A large water user is agriculture, in which Iowa is one of the leading states. Average annual precipitation varies from 34 inches in the southeast to 25 inches in the northwest, with 70% occurring during the growing season. Shallow groundwater quality and quantity have been declining, especially in the southwest and west. The largest pollutant is sediment from topsoil erosion; an estimated 50% of valuable topsoil has been lost in the last 100 years. Seven aspects of water resources are evaluated. GRA

N82-13480# Massachusetts Univ., Amherst. Water Resources Research Center.
MASSACHUSETTS' FIVE-YEAR WATER RESOURCES RESEARCH NEEDS, 1982-1987
Edward L. Goldstein, Joseph S. Larson, and Paul J. Godfrey 1980 83 p refs
(Contract DI-14-34-0001-0131)
(PB81-231961; PUB-122; W81-04318) Avail: NTIS HC A05/MF A01 CSCL 13B

Three major needs for water resources for the next 5 years are examined and a contribution is made to a coordinated research effort by Federal, State, and academic institutions as well as an attempt educate the public to the critical nature of the water resources problem. Massachusetts has no single, dramatic water resource problem; instead, there is a patchwork of local and regional problems of water quality, water quantity, and conflicts over the use of water. The following categories are considered: ground-water development and protection, conservation, water quality and quantity, modernization of supply systems, drinking water quality and treatment, information transfer and management, resource administration, and water resource policy and programs development. GRA

N82-13481# Geological Survey, Albany, N.Y. Water Resources Div.
PRELIMINARY INVESTIGATION OF A SHALLOW GROUND-WATER FLOW SYSTEM ASSOCIATED WITH CONNETQUOT BROOK, LONG ISLAND, NEW YORK Final Report
Keith R. Prince Nov. 1980 42 p refs
(PB81-228751; USGS/WRD-WRI-81-069; USGS/WRI-80-47) Avail: NTIS HC A03/MF A01 CSCL 08H

Under natural conditions, about 95 percent of the flow in Long Island streams is derived from ground-water seepage. The ground-water system that feeds the streams is a shallow subsystem that overlies the regional subsurface flow system. The Connetquot Brook basin was selected for study because it has not been appreciably affected by urbanization. Studies in the basin indicate that the shallow ground-water flow system circulates to a depth of less than 30 feet below the stream channel. Directly beneath The stream, shallow ground-water flow is upward toward the stream channel, but elsewhere in the basin it is predominantly horizontal. GRA

N82-13482# District of Columbia Univ., Washington, D. C. Water Resources Research Center.
THE DISTRICT OF COLUMBIA FIVE-YEAR WATER RESOURCES RESEARCH PROGRAM PLAN, 1982-1987
Mamadou H. Watt Nov. 1980 248 p refs Sponsored by the U.S. Dept. of the Interior
(PB81-234882; WRRC-24) Avail: NTIS HC A11/MF A01 CSCL 08H

The water resources situaton in the District of Columbia is described. Research needs are identified and a 5 year research and development program plan for the D.C. Water Resources Research Center is presented. Geological, meteorological, biological and hydrological characteristics are described as well as surface and groundwater resources. Water resources problems are categorized and prioritized, and related agency activities are presented. GRA

N82-13483# Bureau of Mines, Pittsburgh, Pa. Research Center.
HIGH-PRESSURE SHROUDED WATER SPRAYS FOR DUST CONTROL
N. I. Jayaraman, F. N. Kissell, W. Cross, and J. Janosik Jun. 1981 22 p refs
(PB81-231458; BM-RI-8536) Avail: NTIS HC A02/MF A01 CSCL 08I

High pressure shrouded sprays were tested for air moving capability and dust collection efficiency. It is indicated that at 500 psi and above, the dust collection efficiency, when sampled downstream of a water eliminator, is about 99% for two types of nozzles. However, for the same water flow, the induced airflow was about three times greater in one type than in another. Model mine tests are conducted to determine the reduction in dust concentration behind the line curtain and at the operator position produced by high pressure sprays in a shroud. GRA

N82-13484# National Oceanic and Atmospheric Administration, Rockville, Md. Office of Marine Pollution Assessment.
DEEP OCEAN MINING ENVIRONMENTAL STUDY. ENVIRONMENTAL EFFECTS OF COMMERCIAL-SCALE MINING
Nov. 1980 319 p refs
(PB81-227753; NOAA-81052103) Avail: NTIS HC A14/MF A01 CSCL 08I

Papers on deep ocean mining environmental study are presented. The titles are: estimated discharge characteristics of a commercial nodule mining operation; dissolved components of the discharge; increased oxygen demand and microbial biomass; trace metal exchange between ferromanganese nodules and artificial seawater; dispersion of deep sea mining particulates and their effect on light in ocean surface layer; environmental investigation of the effect of deep sea mining on marine phytoplankton and primary productivity in the tropical eastern north Pacific ocean; potential effects on deep sea minerals mining on macrozooplankton in the north equatorial Pacific; dispersal and resedimentation of the benthic plume from deep sea mining operations; and limits in prediction and detecting benthic community response to manganese nodule mining. GRA

N82-13485# Bureau of Mines, Twin Cities, Minn.
BENEFICATION WITH MAGNETIC FLUIDS
S. E. Khalafalla and G. W. Reimers May 1981 27 p refs
(PB81-227126; BM-RI-8532) Avail: NTIS HC A03/MF A01 CSCL 08I

A new magnetic separation technique that does not rely on the inherent magnetic susceptibility, but rather on the specific gravity of the separated functions is described be applied to segregate a typical waste product for materials recycle and to beneficiate a mineral to recover its precious content. GRA

N82-13486# Pittsburg Univ., Pa. Dept. of Chemical and Petroleum Engineering.
WATER AND ENERGY USAGE IN COAL PREPARATION Final Report
S. H. Chiang and Robert E. Douglas May 1981 575 p refs Sponsored by the Geological Survey
(PB81-238248) Avail: NTIS HC A24/MF A01 CSCL 08I

The demand for water and energy by those industries physically beneficiating Eastern American coals was analyzed and predicted. Both the method and equipment utilized in cleaning coarse and fine coals were evaluated for their respective water and energy requirements. Five typical coal cleaning facilities employing various cleaning, comminution, screening, dewatering and drying equipment were simulated with a computer. Seven characteristic eastern coals (with ash and sulfur concentrations of 19-36 percent and 0.5-8.5 percent, respectively) were systematically evaluated in the conceptual coal preparation plants. GRA

N82-13487# Bureau of Mines, Pittsburgh, Pa. Research Center.
CONTROL OF METHANE BY VENTILATION OF SHAFTS DURING RAISE DRILLING
Slavolijub D. Maksimovic Jun. 1981 17 p refs
(PB81-234502; BM-IC-8847) Avail: NTIS HC A02/MF A01 CSCL 08I

Ventilation surveys at raise drill sites to assess various methods of reducing methane concentration were conducted. It is indicated that raise drill shaft cavities are ventilated by air compressors, vacuum pumps, auxiliary blower fans, and free intake air from the surface. At the bottom of the shaft cavities, ventilation is controlled by regulators and airlocks. Methane is monitored, measured, and periodically sampled on the surface, at the bottom and at different levels in the shaft cavities. It is recommended that the best way to ventilate shaft cavities is through the simultaneous use of air compressors and vacuum pumps. GRA

N82-13488# Bureau of Mines, Pittsburgh, Pa.
CREATING A SAFER ENVIRONMENT IN US COAL MINES: THE BUREAU OF MINES METHANE CONTROL PROGRAM, 1964-79
Milford L. Skow, A. G. Kim, and M. Deul May 1981 57 p refs
(PB81-233918; BM-SP-5-81) Avail: NTIS HC A04/MF A01 CSCL 08I

The principal activities and results of 15 years of research on methane control in coal mines are summarized. Fundamental factors regarding the occurrence and movement of methane in coalbeds, removal of methane prior to mining, and control of methane during mining were investigated. Publications on methane control program, a section on methane recovery and use, a look at the upcoming Bureau of Mines research program, and a brief review of methane drainage practices in other coal producing countries are included. GRA

N82-13489# Bureau of Mines, Pittsburgh, Pa. Research Center.
SUPPRESSION OF COAL DUST EXPLOSION BY WATER BARRIER IN A CONVEYOR BELT ENTRY
I. Liebman and J. K. Richmond Jun. 1981 34 p refs
(PB81-233306; BM-RI-8538) Avail: NTIS HC A03/MF A01 CSCL 08I

Experiments on coal dust explosion suppression were conducted in a simulated working mine environment. It was shown that a coal dust explosion can be readily initiated in a conveyor belt entry and the explosion can spread into adjacent entries through opened crosscuts to propagate for long distances even though the adjacent entries are rock ducted. Passive water barriers are effective in suppressing explosions on a beltway; however, barrier efficiency is reduced by opened crosscuts. It is indicated that the beltway barrier should have continuous rows of water filled tubs covering long distances along the entry.GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N82-13490*# Engelhard Industries, Inc., Edison, N.J.
DEVELOP AND TEST FUEL CELL POWERED ON-SITE INTEGRATED TOTAL ENERGY SYSTEM. PHASE 3: FULL-SCALE POWER PLANT DEVELOPMENT Quarterly Report, Feb. - Apr. 1981
A. Kaufman 24 Jun. 1981 50 p
(Contract DEN3-241)
(NASA-CR-165328; DOE/NASA/0241-1; QR-1) Avail: NTIS HC A03/MF A01 CSCL 10B

An integrated 5 kW power system based upon methanol fuel and a phosphoric acid fuel cell operating at about 473 K is described. Description includes test results of advanced fuel cell catalysts, a semiautomatic acid replenishment system and a completed 5 kW methanol/system reformer. The results of a preliminary system test on a reformer/stack/inverter combination are reported. An initial design for a 25 kW stack is presented. Experimental plans are outlined for data acquisition necessary for design of a 50 kW methanol/steam reformer. Activities related to complete mathematical modelling of the integrated power system, including wasteheat utilization, are described. E.A.K.

N82-13491*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SPACE APPLICABLE DOE PHOTOVOLTAIC TECHNOLOGY: AN UPDATE
J. Scott-Monck, P. Stella, and P. Berman 15 Nov. 1981 25 p refs
(Contract NAS7-100)
(NASA-CR-165021; JPL-Pub-81-91) Avail: NTIS HC A02/MF A01 CSCL 10A

Photovoltaic development projects applicable to space power are identified. When appropriate, the type of NASA support that would be necessary to implement these technologies for space use is indicated. It is conducted that the relatively small market and divergent operational requirements for space power are mainly responsible for the limited transfer of terrestrial technology to space applications. Information on the factors which control the cost and type of technology is provided. Terrestrial modules using semiconductor materials are investigated. S.L.

N82-13492*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DISTRIBUTED PHOTOVOLTAIC SYSTEMS: UTILITY INTERFACE ISSUES AND THEIR PRESENT STATUS
M. Hassan and J. Klein 15 Sep. 1981 166 p refs
(Contracts NAS7-100; DE-AI01-76ET-20356; JPL Proj. 5240-11)
(NASA-CR-165019; JPL-Pub-81-89; DOE/ET-20356/3) Avail: NTIS HC A08/MF A01 CSCL 10A

Major technical issues involving the integration of distributed photovoltaics (PV) into electric utility systems are defined and their impacts are described quantitatively. An extensive literature search, interviews, and analysis yielded information about the work in progress and highlighted problem areas in which additional work and research are needed. The findings from the literature search were used to determine whether satisfactory solutions to the problems exist or whether satisfactory approaches to a solution are underway. It was discovered that very few standards, specifications, or guidelines currently exist that will aid industry in integrating PV into the utility system. Specific areas of concern identified are: (1) protection, (2) stability, (3) system unbalance, (4) voltage regulation and reactive power requirements, (5) harmonics, (6) utility operations, (7) safety, (8) metering, and (9) distribution system planning and design. Author

N82-13493*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A PRELIMINARY ESTIMATE OF FUTURE COMMUNICATIONS TRAFFIC FOR THE ELECTRIC POWER SYSTEM
Roger M. Barnett 15 Oct. 1981 73 p refs
(Contracts NAS7-100; DE-AI01-79ET-29372)
(NASA-CR-165015; JPL-Pub-81-41; DOE/ET-29372/2) Avail: NTIS HC A04/MF A01 CSCL 10B

Diverse new generator technologies using renewable energy, and to improve operational efficiency throughout the existing electric power systems are presented. A description of a model utility and the information transfer requirements imposed by incorporation of dispersed storage and generation technologies and implementation of more extensive energy management are estimated. An example of possible traffic for an assumed system, and an approach that can be applied to other systems, control configurations, or dispersed storage and generation penetrations is provided. E.A.K.

N82-13494*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MEASUREMENT OF SURFACE RECOMBINATION VELOC-

ITY FOR SILICON SOLAR CELLS USING A SCANNING ELECTRON MICROSCOPE WITH PULSED BEAM
Taher Daud and Li-Jen Cheng 1 Nov. 1981 36 p refs
(Contracts NAS7-100; EX-76-A-29-1012; DE-AI01-76ET-20356; JPL Proj. 5101-176)
(JPL-Pub-81-64; DOE/JPL-1012-56) Avail: NTIS HC A03/MF A01 CSCL 10A

The role of surface recombination velocity in the design and fabrication of silicon solar cells is discussed. A scanning electron microscope with pulsed electron beam was used to measure this parameter of silicon surfaces. It is shown that the surface recombination velocity, s, increases by an order of magnitude when an etched surface degrades, probably as a result of environmental reaction. A textured front-surface-field cell with a high-low junction near the surface shows the effect of minority carrier reflection and an apparent reduction of s, whereas a tandem-junction cell shows an increasing s value. Electric fields at junction interfaces in front-surface-field and tandem-junction cells acting as minority carrier reflectors or sinks tend to alter the value of effective surface recombination velocity for different beam penetration depths. A range of values of s was calculated for different surfaces. M.D.K.

N82-13495*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DISH STIRLING SOLAR RECEIVER COMBUSTOR TEST PROGRAM
C. P. Bankston and L. H. Back 15 Aug. 1981 45 p refs
(Contracts NAS7-100; DE-AI01-81ET-20307; JPL Proj. 5105-76)
(NASA-CR-165017; JPL-Pub-81-23; DOE/JPL-1060-41) Avail: NTIS HC A03/MF A01 CSCL 10A

The operational and energy transfer characteristics of the Dish Stirling Solar Receiver (DSSR) combustor/heat exchanger system was evaluated. The DSSR is designed to operate with fossil fuel augmentation utilizing a swirl combustor and cross flow heat exchanger consisting of a single row of 4 closely spaced tubes that are curved into a conical shape. The performance of the combustor/heat exchanger system without a Stirling engine was studied over a range of operating conditions and output levels using water as the working fluid. Results show that the combustor may be started under cold conditions, controlled safety, and operated at a constant air/fuel ratio (10 percent excess air) over the required range of firing rates. Furthermore, nondimensional heat transfer coefficients based on total heat transfer are plotted versus Reynolds number and compared with literature data taken for single rows of closely spaced tubes perpendicular to cross flow. The data show enhanced heat transfer for the present geometry and test conditions. Analysis of the results shows that the present system meets specified thermal requirements, thus verifying the feasibility of the DSSR combustor design for final prototype fabrication. J.M.S.

N82-13496*# Solarex Corp., Rockville, Md.
A MODULE EXPERIMENTAL PROCESS SYSTEM DEVELOPMENT UNIT (MEPSDU) Quarterly Report, 1 May - 31 Aug. 1981
31 Aug. 1981 57 p refs Sponsored in part by DOE Prepared for JPL, Pasadena
(Contract JPL-955902)
(NASA-CR-165014; QR-3; JPL-9950-603; DOE/JPL-955902-81/3) Avail: NTIS HC A04/MF A01 CSCL 10A

A cost effective process sequence and machinery for the production of flat plate photovoltaic modules are described. Cells were fabricated using the process sequence which was optimized, as was a lamination procedure. Insulator tapes and edge seal material were identified and tested. Encapsulation materials were evaluated. S.L.

N82-13497*# Westinghouse Research and Development Center, Pittsburgh, Pa.
LARGE AREA SHEET TASK: ADVANCED DENDRITIC WEB GROWTH DEVELOPMENT Quarterly Report, 1 Apr. - 30 Jun.
C. S. Duncan, R. G. Seidensticker, J. P. McHugh, R. H. Hopkins, D. Meier, and J. Schruben 6 Oct. 1981 39 p refs Sponsored in part by DOE Prepared for JPL, Pasadena
(Contract JPL-955843)
(NASA-CR-165013; JPL-9950-605; DOE/JPL-955843-81/3) Avail: NTIS HC A03/MF A01 CSCL 10A

The growth of silicon dendritic web for photovoltaic applications was investigated. The application of a thermal model for calculating buckling stresses as a function of temperature profile in the web is discussed. Lid and shield concepts were evaluated to provide the data base for enhancing growth velocity. An experimental web growth machine which embodies in one unit the mechanical and electronic features developed in previous work was developed. In addition, evaluation of a melt level control system was begun, along with preliminary tests of an elongated crucibl design. The economic analysis was also updated to incorporate some minor cost changes. The initial applications of the thermal model to a specific configuration gave results consistent with experimental observation in terms of the initiation of buckling vs. width for a given crystal thickness. B.W.

N82-13498*# Union Carbide Corp., Oak Ridge, Tenn.
FLAT-PLATE SOLAR ARRAY PROJECT: EXPERIMENTAL PROCESS SYSTEM DEVELOPMENT UNIT FOR PRODUCING SEMICONDUCTOR-GRADE SILICON USING THE SILANE-TO-SILICON PROCESS Quarterly Progress Report, Jul. - Sep. 1981
Sep. 1981 56 p Sponsored in part by DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-954334)
(NASA-CR-165022; JPL-9950-606; DOE/JPL-954334/20) Avail: NTIS HC A04/MF A01 CSCL 10A

The engineering design, fabrication, assembly, operation, economic analysis, and process support research and development for an Experimental Process System Development Unit for producing semiconductor-grade silicon using the slane-to-silicon process are reported. The design activity was completed. About 95% of purchased equipment was received. The draft of the operations manual was about 50% complete and the design of the free-space system continued. The system using silicon power transfer, melting, and shotting on a psuedocontinuous basis was demonstrated. Author

N82-13499*# Photowatt International, Inc., Tempe, Ariz.
DEVELOPMENT OF TECHNIQUE FOR AR COATING AND NICKEL AND COPPER METALLIZATION OF SOLAR CELLS: FPS PROJECT, PRODUCT DEVELOPMENT Quarterly Technical Report, 15 May - 30 Sep. 1981
C. G. Rominger 15 Oct. 1981 26 p Prepared for JPL, Pasadena
(Contract JPL-955986)
(NASA-CR-165033; QTR-1; JPL-9950-609; DOE/JPL-955986-1) Avail: NTIS HC A03/MF A01 CSCL 10A

Silicon nitride and nickel pastes are investigated in conjunction with a brush copper plating process for the purpose of identifying one or more fabrication sequences which yield at least 10 percent efficient N(+)/P(+) flat plate solar cells. The adhesion of all nickel pastes is reduced significantly when subjected to acidic and alkaline brush copper plating solutions as a result of a combination of thermally induced stress and chemical attack of the frit, which occurs at the interface with the silicon solar cell. The AgF is penetrating the 800 a of Si3N4 and ohmic contact is occurring at all fire-in tempertures. During the brush plating process, fingers and buss bars tend to spread. S.L.

N82-13500*# Kayex Corp., Rochester, N. Y.
CONTINUOUS CZOCHRALSKI GROWTH: SILICON SHEET GROWTH DEVELOPMENT OF THE LARGE AREA SHEET TASK OF THE LOW COST SILICON SOLAR ARRAY PROJECT Final Report, 1 Oct. 1977 - 31 Mar. 1980
C. Moody Johnson Dec. 1980 292 p refs Sponsored in part by DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-954888)
(NASA-CR-165030; JPL-9950-610; DOE/JPL-954888-80/12) Avail: NTIS HC A13/MF A01 CSCL 10A

The growth of 100 kg of silicon single crystal material, ten cm in diameter or greater, and 150 kg of silicon single crystal material 15 cm or greater utilizing one common silicon container material (one crucible) is investigated. A crystal grower that is recharged with a new supply of polysilicon material while still

under vacuum and at temperatures above the melting point of silicon is developed. It accepts large polysilicon charges up to 30 kg, grows large crystal ingots (to 15 cm diameter and 25 kg in weight), and holds polysilicon material for recharging (rod or lump) while, at the same time, growing crystal ingots. Special equipment is designed to recharge polysilicon rods, recharge polysilicon lumps, and handle and store large, hot silicon crystal ingots. Many continuous crystal growth runs were performed lasting as long as 109 hours and producing as many as ten crystal ingots, 15 cm with weights progressing to 27 kg. S.L.

N82-13501*# Spectrolab, Inc., Sylmar, Calif.
HIGH RESOLUTION, LOW COST SOLAR CELL CONTACT DEVELOPMENT Final Report
N. Mardesich [1981] 82 p Sponsored in part by DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-955725)
(NASA-CR-165032; JPL-9950-611; DOE/JPL-955725-81/1) Avail: NTIS HC A05/MF A01 CSCL 10A

The MIDFILM cell fabrication and encapsulation processes were demonstrated as a means of applying low-cost solar cell collector metallization. The average cell efficiency of 12.0 percent (AM1, 28 C) was achieved with fritted silver metallization with a demonstration run of 500 starting wafers. A 98 percent mechanical yield and 80 percent electrical yield were achieved through the MIDFILM process. High series resistance was responsible for over 90 percent of the electrical failures and was the major factor causing the low average cell efficiency. Environmental evaluations suggest that the MIDFILM cells do not degrade. A slight degradation in power was experienced in the MIDFILM minimodules when the AMP Solarlok connector delaminated during the environmental testing. T.M.

N82-13502*# Solarex Corp., Rockville, Md.
DESIGN, FABRICATION, TEST, QUALIFICATION, AND PRICE ANALYSIS OF THIRD GENERATION DESIGN SOLAR CELL MODULES Final Design Report
15 Oct. 1981 33 p Sponsored in part by DOE Prepared for JPL, Pasadena
(Contract JPL-955404)
(NASA-CR-165007; JPL-9950-612; DOE/JPL-955404-81/1) Avail: NTIS HC A03/MF A01 CSCL 10A

The fabrication of solar cell modules is detailed with emphasis upon laminating and interconnecting the panels that hold the simicrystalline silicon cells. Design problems and enviromental tests are described as well as performance characteristics. R.J.F.

N82-13503*# Springborn Labs., Inc., Enfield, Conn.
INVESTIGATION OF TEST METHODS, MATERIAL PROPERTIES, AND PROCESSES FOR SOLAR CELL ENCAPSULANTS Annual Report
P. B. Willis Jun. 1981 128 p refs Sponsored in part by DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-954527)
(NASA-CR-165031; JPL-9950-613; DOE/JPL-954527-81/19) Avail: NTIS HC A07/MF A01 CSCL 10A

Encapsulant materials and processes for the production of cost effective, long life solar cell modules are identified, and evaluated. Ethylene vinyl acetate lamination pottant studies are conducted with respect to the time/temperature cure requirements for successful use of this compound. The time needed to produce successful gel contents are redetermined at a variety of temperatures and are related to the peroxide half life temperature curve. Formulation of the butyl acrylate syrup casting pottant is complete. The formulation contains an ultraviolet stabilizer system and is cured with an initiator that presents no shipping or handling hazards. The catalyzed syrup is stable at room temperature and has a pot life of at least an eight hour period of time. The syrup cures to a transparent rubber in 18 minutes at a temperature of 60 C. S.L.

N82-13504*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CATALYTIC COMBUSTION OF RESIDUAL FUELS
Daniel L. Bulzan and Robert R. Tacina 1981 20 p refs Presented at 5th Workshop on Catalytic Combustion, San Antonio, Tex., 15-16 Sep. 1981
(Contract DE-AI01-77ET-10350)
(NASA-TM-82731; E-1040) Avail: NTIS HC A02/MF A01 CSCL 21B

A noble metal catalytic reactor was tested using two grades of petroleum derived residual fuels at specified inlet air temperatures, pressures, and reference velocities. Combustion efficiencies greater than 99.5 percent were obtained. Steady state operation of the catalytic reactor required inlet air temperatures of at least 800 K. At lower inlet air temperatures, upstream burning in the premixing zone occurred which was probably caused by fuel deposition and accumulation on the premixing zone walls. Increasing the inlet air temperature prevented this occurrence. Both residual fuels contained about 0.5 percent nitrogen by weight. NO sub x emissions ranged from 50 to 110 ppm by volume at 15 percent excess O2. Conversion of fuel-bound nitrogen to NO sub x ranged from 25 to 50 percent. M.D.K.

N82-13505*# Paragon Pacific, Inc., El Segundo, Calif.
DEVELOPMENT REPORT: AUTOMATIC SYSTEM TEST AND CALIBRATION (ASTAC) EQUIPMENT Final Report
Robert J. Thoren Jul. 1981 25 p ref
(Contracts DEN3-203; DE-AI01-76ET-20320)
(NASA-CR-165403; DOE/NASA/0203-1; PPI-3009-4) Avail: NTIS HC A02/MF A01 CSCL 10A

A microcomputer based automatic test system was developed for the daily performance monitoring of wind energy system time domain (WEST) analyzer. The test system consists of a microprocessor based controller and hybrid interface unit which are used for inputing prescribed test signals into all WEST subsystems and for monitoring WEST responses to these signals. Performance is compared to theoretically correct performance levels calculated off line on a large general purpose digital computer. Results are displayed on a cathode ray tube or are available from a line printer. Excessive drift and/or lack of repeatability of the high speed analog sections within WEST is easily detected and the malfunctioning hardware identified using this system. E.A.K.

N82-13506*# Eaton Engineering and Research Center, Southfield, Mich.
THE ac PROPULSION SYSTEM FOR AN ELECTRIC VEHICLE, PHASE 1 Final Report
Steven Geppert Aug. 1981 307 p refs
(Contracts DEN3-125; DE-AI01-77CS-51044)
(NASA-CR-165480; DOE/NASA/0125-1; ERC-TR-8101) Avail: NTIS HC A14/MF A01 CSCL 10B

A functional prototype of an electric vehicle ac propulsion system was built consisting of a 18.65 kW rated ac induction traction motor, pulse width modulated (PWM) transistorized inverter, two speed mechanically shifted automatic transmission, and an overall drive/vehicle controller. Design developmental steps, and test results of individual components and the complex system on an instrumented test frame are described. Computer models were developed for the inverter, motor and a representative vehicle. A preliminary reliability model and failure modes effects analysis are given. E.A.K.

N82-13507*# Case Western Reserve Univ., Cleveland, Ohio.
TRANSIENT CATALYTIC COMBUSTOR MODEL Final Report
James S. Tien May 1981 87 p refs
(Grant NsG-3230; Contract DE-AI01-77CS-51040)
(NASA-CR-165324; DOE/NASA/3230-1) Avail: NTIS HC A05/MF A01 CSCL 10B

A quasi-steady gas phase and thermally thin substrate model is used to analyze the transient behavior of catalytic monolith combustors in fuel lean operation. The combustor response delay is due to the substrate thermal ineria. Fast response is favored by thin substrate, short catalytic bed length, high combustor inlet and final temperatures, and small gas channel diameters. The calculated gas and substrate temperature time history at different axial positions provides an understanding of how the catalytic combustor responds to an upstream condition change. The computed results also suggest that the gas residence times in the catalytic bed in the after bed space are correlatable with the nondimensional combustor response time. The model also performs steady state combustion calculations; and the computed steady state emission characteristics show agreement with available experimental data in the range of parameters covered.

A catalytic combustor design for automotive gas turbine engine which has reasonably fast response (< 1 second) and can satisfy the emission goals in an acceptable total combustor length is possible. S.L.

N82-13508*# Life Systems, Inc., Cleveland, Ohio.
ENDURANCE TEST AND EVALUATION OF ALKALINE WATER ELECTROLYSIS CELLS Annual Report
K. A. Burke and F. H. Schubert Nov. 1981 46 p refs
(Contract NAS3-21287)
(NASA-CR-165424; TR-376-16) Avail: NTIS HC A03/MF A01 CSCL 10C

Utilization in the development of multi-kW low orbit power systems is discussed. The following technological developments of alkaline water electrolysis cells for space power application were demonstrated: (1) four 92.9 cm2 single water electrolysis cells, two using LST's advanced anodes and two using LST's super anodes; (2) four single cell endurance test stands for life testing of alkaline water electrolyte cells; (3) the solid performance of the advanced electrode and 355 K; (4) the breakthrough performance of the super electrode; (5) the four single cells for over 5,000 hours each significant cell deterioration or cell failure. It is concluded that the static feed water electrolysis concept is reliable and due to the inherent simplicity of the passive water feed mechanism coupled with the use of alkaline electrolyte has greater potential for regenerative fuel cell system applications than alternative electrolyzers. A rise in cell voltage occur after 2,000-3,000 hours which was attributed to deflection of the polysulfone end plates due to creepage of the thermoplastic. More end plate support was added, and the performance of the cells was restored to the initial performance level. E.A.K.

N82-13509*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GAS-TURBINE CRITICAL RESEARCH AND ADVANCED TECHNOLOGY SUPPORT PROJECT Annual Report
John S. Clark, Philip E. Hodge, Carl E. Lowell, David N. Anderson, and Donald F. Schultz Mar. 1981 50 p refs
(Contract DE-AI01-77ET-10350)
(NASA-TM-81708; DOE/NASA/2593-24; E-737) Avail: NTIS HC A03/MF A01 CSCL 10B

A technology data base for utility gas turbine systems capable of burning coal derived fuels was developed. The following areas are investigated: combustion; materials; and system studies. A two stage test rig is designed to study the conversion of fuel bound nitrogen to NOx. The feasibility of using heavy fuels in catalytic combustors is evaluated. A statistically designed series of hot corrosion burner rig tests was conducted to measure the corrosion rates of typical gas turbine alloys with several fuel contaminants. Fuel additives and several advanced thermal barrier coatings are tested. Thermal barrier coatings used in conjunction with low critical alloys and those used in a combined cycle system in which the stack temperature was maintained above the acid corrosion temperature are also studied. E.A.K.

N82-13510*# Acurex Corp., Mountain View, Calif. Energy and Environmental Div.
DEVELOPMENT OF A HIGH-TEMPERATURE DURABLE CATALYST FOR USE IN CATALYTIC COMBUSTORS FOR ADVANCED AUTOMOTIVE GAS TURBINE ENGINES Final Report
H. Tong, G. C. Snow, E. K. Chu, R. L. S. Chang, M. J. Angwin, and S. L. Pessagno Sep. 1981 169 p refs
(Contracts DEN3-83; DE-AI01-77CS-51040)
(NASA-CR-165396; DOE/NASA/0083-1) Avail: NTIS HC A08/MF A01 CSCL 10B

Durable catalytic reactors for advanced gas turbine engines were developed. Objectives were: to evaluate furnace aging as a cost effective catalytic reactor screening test, measure reactor degradation as a function of furnace aging, demonstrate 1,000 hours of combustion durability, and define a catalytic reactor system with a high probability of successful integration into an automotive gas turbine engine. Fourteen different catalytic reactor concepts were evaluated, leading to the selection of one for a durability combustion test with diesel fuel for combustion conditions. Eight additional catalytic reactors were evaluated and one of these was successfully combustion tested on propane fuel. This durability reactor used graded cell honeycombs and a combination of noble metal and metal oxide catalysts. The reactor was catalytically active and structurally sound at the end of the durability test. E.A.K.

N82-13511*# Westinghouse Research and Development Center, Pittsburgh, Pa.
CELL MODULE AND FUEL CONDITIONER DEVELOPMENT Quarterly Report, Jul. - Sep. 1981
D. Q. Hoover, Jr. Oct. 1981 59 p
(Contracts DEN3-161; DE-AI01-80ET-17088)
(NASA-CR-165462; DOE/NASA/0161-9; Rept-81-9D1-MARED-R1) Avail: NTIS HC A04/MF A01 CSCL 10A

The results of pretesting and performance testing of Stack 564 are reported. The design features, progress in fabrication and plans for assembly of Stack 800 are given. The status of endurance testing of Stack 560 is reported. The design, fabrication, test procedures and preliminary tests of the 10 kW double counterflow reformer and the reformer test stand are described. Results of vendor contacts to define the performance and cost of fuel conditioning system components are reported. The results of burner tests and continuing development of the BOLTAR program are reported. T.M.

N82-13512# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
ALTERNATE HYBRID POWER SOURCES FOR REMOTE SITE APPLICATIONS Final Report, Feb. 1980 - Feb. 1981
W. Richard Powell, Robert J. Taylor, J. L. Baron, E. E. Mengel, and J. C. Ray Feb. 1981 229 p refs
(Contracts N00024-78-C-5384; MIPR-Z-70099)
(AD-A099471; USCG-D-06-81) Avail: NTIS HC A11/MF A01 CSCL 10/2

Operation of diesel electric generators at remote Coast Guard sites are discussed. The electric power required by modules and subsystems in a modern lighthouse was investigated. The availability of wind power, solar energy, and other renewable energy sources in the local environment at remote lighthouses and other sites is discussed. A life cycle cost analysis methodology applicable to continuously variable life expectancies is developed and illustrated. Diesel generator costs, including service visit expenses, are modeled. Other factors relating to the analysis of alternate energy systems as supplements to diesel electric generators at remote sites are discussed. Author

N82-13513# Harry Diamond Labs., Adelphi, Md.
CAMELOT: A NOVEL CONCEPT FOR A MULTITERAWATT PULSE POWER GENERATOR FOR SINGLE PULSE BURST OR REPETITION RATE OPERATION
Alexander G. Stewart Apr. 1981 19 p refs
(DA Proj. 1L1-61101-A-91-A)
(AD-A103024; HDL-SR-81-1) Avail: NTIS HC A02/MF A01 CSCL 10/2

Superpower pulse generators are fast establishing themselves internationally as candidates for employment in a wide variety of military applications including electronic warfare and jamming, high energy beam weapons, and nuclear weapons effects simulation. Unfortunately, existing multimegajoule pulse power generators such as AURORA do not satisfy many Department of Defense goals fo field-adaptable weapon systems-for example, repetition (rep) rate operation, high reliability, long life, ease of operation, and low maintenance. The Camelot concept is a multiterawatt rep ratable pulse power source, adaptable to a wide range of output parameters - both charged particles and photons. An analytical computer model has been developed to predict the power flowing through the device. A 5-year development program, culminating in a source region electromagnetic pulse simulator, is presented. Author

N82-13514# Solarex Corp., Rockville, Md.
SILICON SOLAR CELL OPTIMIZATION Final Report, 15 Aug. 1978 - 15 Feb. 1981
Alan L. Scheinine, John H. Wohlgemuth, and Eileen Sparks Wright-Patterson AFB, Ohio AFWAL Jun. 1981 99 p refs
(Contract F33615-78-C-2039; AF Proj. 3145)
(AD-A106005; AFWAL-TR-81-2052) Avail: NTIS HC A05/MF A01 CSCL 10/2

This research program has resulted in improvements in vertical

junction solar cell techniques leading to higher efficiencies and improved handleability. Vertical junction solar cells have now been fabricated with AMO conversion efficiency greater than 15% (25 C). A variety of cells have been fabricated including different groove depths, substrate thicknesses and bulk resistivities. Cell performance has been measured both before and after irradiation. Theoretical analyses has been performed to generate computer models of I-V curves for various cell geometries.
Author (GRA)

N82-13515# Electric Power Research Inst., Palo Alto, Calif. Steam Generator Project Office.
WORKSHOP PROCEEDINGS: U-BEND TUBE CRACKING IN STEAM GENERATORS
Carl E. Shoemaker, ed. Jun. 1981 343 p refs Workshop held at Denver, 20-21 Aug. 1980
(DE81-903765; EPRI-WS-80-136; CONF-8008122) Avail: NTIS HC A15/MF A01

A design to reduce the rate of tube failure in high pressure feedwater heaters, a number of failed drawn and stress relieved Monel 400 U-bend tubes removed from three high pressure feedwater heaters was examined. Steam extracted from the turbine is used to preheat the boiler feedwater in fossil fuel fired steam plants to improve thermal efficiency. This is accomplished in a series of heaters between the condenser hot well and the boiler. The heaters closest to the boiler handle water at high pressure and temperature. Because of the severe service conditions, high pressure feedwater heaters are frequently tubed with drawn and stress relieved Monel 400. DOE

N82-13516# Oak Ridge National Lab., Tenn.
DC DIELECTRIC STRENGTHS OF FLUORINATED BENZENES AND THE STORED-ENERGY THEORY
D. H. Smith, D. W. Bouldin, and L. G. Christophorou 1981 5 p refs Presented at 7th Intern. Conf. on Conduction and Breakdown in Dielectric Liquids, Berlin, 27 Jul. 1981
(Contract W-7405-eng-26)
(DE81-026515; CONF-810734-1) Avail: NTIS HC A02/MF A01

A systematic study of the hydrofluorobenzenes to quantify the effect of liquid polarity on the dielectric strength is described. Two important relationships are introduced: dielectric strength decreased as the number of fluorines increased; and dielectric strength decreased as the dielectric constant (or capacitance) increased. The second relationship is based on a postulate that breakdown occurs at a critical value of the energy stored in the test apparatus, which is the same for all of hydrofluorobenzenes. T.M.

N82-13517# Brookhaven National Lab., Upton, N. Y.
CRYOGENIC TESTING OF 100-M SUPERCONDUCTING POWER TRANSMISSION TEST FACILITY
R. J. Gibbs, J. E. Jensen, and R. A. Thomas 1981 8 p refs Presented at 1981 Cryogenic Engr. Conf., San Diego, 10 Aug. 1981
(Contract DE-AC02-76CH-00016)
(DE81-028331; BNL-29900; CONF-810835-2) Avail: NTIS HC A02/MF A01

The system was designed to cool the test facility for transmission cables. The system was modified to incorporate a fourth turbine placed remotely from the refrigerator at the far end of the load. In this configuration the load, consisting of the superconducting cables and their containment vessel, becomes a long counterflow heat exchanger with internal heat generation. The results of these tests are presented with discussion of the operation, equipment performance, and possible areas for improvement. T.M.

N82-13518# Oregon State Univ., Corvallis. Dept. of Atmospheric Science.
NETWORK WIND POWER OVER THE PACIFIC NORTHWEST. APPENDIX 1: WIND STATISTICS SUMMARIES FOR THE WIND POWER DATA STATIONS Progress Report, Oct. 1979 - Sep. 1980
R. W. Baker and E. W. Hewson Oct. 1980 122 p refs
(DE81-029291; DOE/BP-60) Avail: NTIS HC A06/MF A01

Tables and graphs are presented concerning monthly wind speed summaries; wind spectrum analyzer summaries; high wind speed summaries; and six hourly speed and direction plots for selected wind power sites. Wind flow plots in the Goodnoe Hills MOD-2 wind turbine area and wind flow plots in the Goodnoe Hills and Juniper Point area are included. DOE

N82-13519# Oregon State Univ., Corvallis. Dept. of Atmospheric Science.
WIND POWER: RESEARCH ON NETWORK WIND POWER OVER THE PACIFIC NORTHWEST. EXECUTIVE SUMMARY Progress Report, Oct. 1979 - Sep. 1980
R. W. Baker and E. W. Hewson Oct. 1980 23 p refs
(DE81-029360; DOE/BP-58) Avail: NTIS HC A02/MF A01

The research in FY-80 is composed of six primary tasks. These tasks include data collection and analysis, wind flow studies around an operational wind turbine generator (WTG), kite anemometer calibration, wind flow analysis and prediction, the Klickitat County small wind energy conversion system (SWECS) program, and network wind power analysis. The data collection and analysis task consists of four sections, three of which deal with wind flow site surveys and the fourth with collecting and analyzing wind data from existing data stations. DOE

N82-13520# Sandia Labs., Albuquerque, N. Mex.
GEOTHERMAL-RESOURCE VERIFICATION FOR AIR FORCE BASES
P. R. Grant, Jr. Jun. 1981 56 p refs
(Contract DE-AC04-76DP-00789)
(DE81-027482; SAND-81-7123) Avail: NTIS HC A04/MF A01

The various tupe of geothermal energy and legal uncertainties of the resource are summarized. A methodology to evaluate geothermal resources for applications to US Air Force bases is described. Estimates suggest that exploration costs will be $50,000 to $300,000 which, if favorable, would lead to drilling a $500,000 exploration well. Successful identification and development of a geothermal resource could provide all base, fixed system needs with an inexpensive, renewable energy source. T.M.

N82-13521# Los Alamos Scientific Lab., N. Mex.
COMPUTER-AUTOMATED CONTROLS FOR SUPERCONDUCTING MAGNETIC ENERGY STORAGE
Alphonse L. Criscuolo 1981 6 p refs Presented at the Mech., Magnetic, and Underground Energy Storage Ann. Contractors' Rev., Washington, D.C., 24-26 Aug. 1981
(Contract W-7405-eng-36)
(DE81-028697; LA-UR-81-2307; CONF-810833-6) Avail: NTIS HC A02/MF A01

A computer automated control system that allows unmanned operation of the superconducting magnetic energy storage (SMES) system was designed. In addition to unmanned operation the computer offers continual monitoring and recording of all the important SMES signals, operator guidance in starting up and maintaining SMES, emergency shutdown control, and high speed data acquisition for failure diagnosis. The major components of the computer automated control system are two slave computers that perform the data acquisition and a master computer that performs the control. DOE

N82-13522# Department of Energy, Oak Ridge, Tenn. Technical Information Center.
INFORMATION RESOURCES IN THE USA ON NEW AND RENEWABLE ENERGY, A DESCRIPTION AND DIRECTORY
1 Jun. 1981 81 p Presented at the United Nations Conf., Nairobi, Kenya, Aug. 1981
(DE81-028867; CONF-810802-2) Avail: NTIS HC A05/MF A01

The production dissemination, and availability of US scientific and technical information about new and renewable energy resources, the policy framework within which the technologies are developed, and the roles of public and private sectors are reported. A directory of sources of additional information, printed material, computerized data bases, institutional services, personal contacts, about the use of new and renewable energy is included. DOE

N82-13523# Oak Ridge National Lab., Tenn. Energy Div.
ANNUAL CYCLE ENERGY SYSTEM EXPERIMENTAL PERFORMANCE AND NATIONAL APPLICABILITY
Van D. Baxter 1981 6 p refs Presented at the IECEC Conf., Atlanta, 9 Aug. 1981 Submitted for publication
(Contract W-7405-eng-26)
(DE81-028570; CONF-810812-32) Avail: NTIS HC A02/MF A01

The energy conserving potential of the annual cycle energy system (ACES) was demonstrated. The performance of the ACES was compared with that of two different air to air heat pumps in an identical house, the control house. The ACES achieved nearly all of its theoretical performance predictions and verified its design criteria. The system delivered residential heating and cooling services while consuming only 57 percent as much electricity as the best conventional alternative tested. Computer studies show the ACES to be applicable to all US climatic zones except those with very low heating needs. DOE

N82-13524# California Univ., Berkeley. Lawrence Berkeley Lab.
THERMAL PERFORMANCE OF WINDOWS HAVING HIGH SOLAR TRANSMITTANCE
Michael Rubin and Stephen Selkowitz Jul. 1981 6 p refs Presented at the Am. Section of the Intern. Solar Energy Soc., 6th Natl. Passive Solar Conf., Portland, Oreg., 8-10 Sep. 1981
(Contract W-7405-eng-48)
(DE81-028872; LBL-12288; CONF-810925-16) Avail: NTIS HC A02/MF A01

The optical and thermal properties of antireflected polyester films and low iron glass sheets are discussed, and the solar and thermal characteristics of windows incorporating high transmittance glazing layers are derived. The plastic films utilize coatings to reduce loses due to surface reflectance and the glass is made with low levels of impurities to reduce adsorption within the material itself. Comparisons among these and other types of windows are made for net energy use for residential buildings in winter. DOE

N82-13525# South Carolina Energy Research Inst., Columbia.
RESIDUAL-ENERGY-APPLICATIONS PROGRAM ENVIRONMENTAL ANALYSIS REPORT
Torgny J. Vigerstad and F. J. McCrosson Oct. 1980 48 p refs
(Contract DE-AC09-77ET-12866)
(DE81-027538; DOE/ET-12866/5) Avail: NTIS HC A03/MF A01

Environmental analysis performance support of a facility to test industrial scale waste heat recovery equipment and utilization are documented. Topics covered include: legal requirements, likely sites, and operating characteristics of equipment to be tested. Environmental issues surrounding the use of the P-reactor and Par Pond as sources of heating and cooling water are addressed. The Par Pond cooling system is considered for siting of the Energy Applied Systems Tests (EAST) Facility. The Par Pond system has the potential to confine all potential environmental impacts of the construction and operation of the EAST Facility within the boundaries of the Savannah River Plant. Characteristics of the EAST Facility are described and a general description of Par Pond is given. DOE

N82-13526# South Carolina Energy Research Inst., Columbia.
RESIDUAL-ENERGY-APPLICATION PROGRAM: EAST FACILITY REQUIREMENTS DOCUMENT, VOLUME 1
P. W. Yngve, F. H. Zander, and F. J. McCrosson 31 Jul. 1981 85 p refs
(Contract DE-AC09-77ET-12866)
(DE81-027536; DOE/ET-12866/8-Vol-1) Avail: NTIS HC A05/MF A01

The objectives of the EAST Facility are to perform research and development on heat energy recovery and conversion equipment; establish high confidence in system performance, system availability, and system operating, maintenance, and material costs; and provide a national competence in technologies required for the installation and operation of heat recovery systems. An initial testing capability recommended for EAST is presented and design specifications are provided for the physical plant and major test support systems. Five options are included for tailoring the full-up testing capability to reduce costs of the core facility. T.M.

N82-13527# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
PROGRAM PLANNER'S GUIDE TO GEOTHERMAL DEVELOPMENT IN CALIFORNIA
W. W. S. Yen, David M. Chambers, Jon F. Elliott, John P. Whittier, J. Jeffrey Schnoor, and Susan Blachman 30 Sep. 1980 314 p refs
(Contract W-7405-eng-48)
(DE82-000700; LBL-12961) Avail: NTIS HC A14/MF A01

The resource base, status of geothermal development activities, and the state's energy flow are summarized. The present and projected geothermal share of the energy market is discussed. The public and private sector initiatives supporting geothermal development in California are described. These include legislation to provide economic incentives, streamline regulation, and provide planning assistance to local communities. Private sector investment, research, and development activities are also described. The appendices provide a ready reference of financial incentives. DOE

N82-13528# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
INEXPENSIVE THERMOGRAPHIC TECHNIQUES FOR DETERMINING RELIABLE SOLAR-COLLECTOR-ARRAY PERFORMANCE
A. Eden and T. Haverty Sep. 1981 35 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-001151; SERI/TR-721-1161) Avail: NTIS HC A03/MF A01

Thermographic equipment, capable of detecting flow blockages, flow imbalances, and total array shutdown in residential and commercial solar energy collector systems is investigated. The abilities of inexpensive thermographic equipment to perform solar array examinations in the field environment are described. It was found that less expensive instruments, in combinations to enhance the capabilities of each general type, can be used to examine solar collector arrays. Expert infrared equipment operators are not required to obtain some conclusions on system problems. A combination of pot radiation thermometers with either a hand-held imager or thermoprofile instrument is a viable inspection tool. Assessment of reliable flow control components, blocked collectors, unbalanced flow distribution, and reversed flow can all be observed with the combination of instruments. DOE

N82-13529# Sandia Labs., Livermore, Calif. Materials Development.
EVALUATION OF CREEP-FATIGUE LIFE-PREDICTION MODELS FOR THE SOLAR CENTRAL RECEIVER
J. M. Hyzak and Darcy A. Hughes Sep. 1981 55 p refs
(Contract DE-AC04-76DP-00789)
(DE82-000942; SAND-81-8220) Avail: NTIS HC A04/MF A01

The applicability of several creep fatigue models to life prediction of boiler tubes in a solar central receiver (SCR) was evaluated. The SCR boiler tubes will experience compressive strain dwell loading with hold times up to 6 to 8 hours at temperatures where time dependent deformation will occur. The evaluation criteria include the ability of the model to account for mean stress effects and to be practical in the long life, small strain range regime. A correlation between maximum tensile stress and fatigue life is presented. Using this correlation, compressive dwell behavior is predicted based on continuous cycling data. The limits of this predictive scheme are addressed. DOE

N82-13530# Sandia Labs., Livermore, Calif.
SOLAR-CENTRAL-RECEIVER FUELS AND CHEMICALS Project Status Report, Oct. 1980 - Jun. 1981
R. W. Carling, J. D. Fish, L. G. Radosevich, and J. Vitko, Jr. Aug. 1981 22 p refs
(Contract DE-AC04-76DP-00789)
(DE82-000941; SAND-81-8232) Avail: NTIS HC A02/MF A01

Solar central receiver fuels and chemicals processes were

studied. Ethane pyrolysis and steam reforming of methane were investigated in-depth in addition to coal gasification, oil shale retorting, and biomass flash pyrolysis. The study criteria, status of ongoing work, and future activities are described. DOE

N82-13531# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

SOLAR THERMAL ENERGY SYSTEMS Annual Technical Progress Report

Jul. 1981 157 p refs

(Contracts DE-AC02-77CH-00178; EG-77-C-01-1012)

(DE81-029295; DOE/CS-4042/2) Avail: NTIS HC A08/MF A01

Technical progress in the solar thermal energy systems program is summarized. Each project description includes a brief history, significant achievements, future activities, and a forecast of anticipated achievements. Point focus, central receiver and line focus technologies, research and advanced development components, materials, fuels and chemicals, and solar ponds are discussed. DOE

N82-13532# Sandia Labs., Albuquerque, N. Mex.

INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE REPORT. VOLUME 2 FOR BEVERLY HIGH SCHOOL, BEVERLY, MASS.

Sep. 1981 21 p *Prepared in cooperation with Boeing Computer Services Co., Seattle, Wash.*

(Contract DE-AC04-76DP-00789)

(DE82-000811; SAND-81-7088-2) Avail: NTIS HC A02/MF A01

Performance data were listed and graphed for an intermediate photovoltaic system at a high school in Massachusetts for the month of July 1981. The energy production, incident solar energy and efficiency are given, and the daily energy production and efficiency, and energy production as a function of power and voltage are graphed. The output of the power conditioner, insolation, heating and cooling loads, temperature and wind data, and the number of freeze thaw cycles are presented. DOE

N82-13533# Lincoln Lab., Mass. Inst. of Tech., Lexington.

DATA REPORT FOR THE NORTHEAST RESIDENTIAL *EXPERIMENT STATION, JUNE 1981*

M. C. Russell, P. Raghuraman, and J. J. Farrell Aug. 1981 14 p

(Contract DE-AC02-76ET-20279)

(DE82-000068; DOE/ET-20279/154) Avail: NTIS HC A02/MF A01

Five prototype residential photovoltaic systems consisting of a roof-mounted array, sized to meet at least 50 percent of the annual electrical demand of an energy-conserving house, and an enclosed structure to house the remainder of the photovoltaic equipment, test instrumentation, and work space are being monitored to provide authoritative and accurate information concerning system performance and the typical loads which they serve. One month of physical data is presented for each system as well as an hour-by-hour tabulation for an average day of the month. A common feature of all the systems is that excess solar-generated electric energy is fed back to the utility grid, thus eliminating the need for on-site storage. A.R.H.

N82-13534# *Arizona State Univ., Tempe. Coll. of Engineering and Applied Sciences.*

EXPERIMENTAL AND ANALYTICAL SYSTEMS STUDIES OF *A COMBINED THERMAL-PHOTOVOLTAIC* RESIDENTIAL SOLAR SYSTEM Technical Status Report, 1 Jan. - 29 Feb. 1980

Byard D. Wood 1980 10 p

(Contract DE-AC03-79CS-30203)

(DE81-029539; DOE/CS-303203/T5; TSR-3) Avail: NTIS HC A02/MF A01

A combined thermal photovoltaic residential solar system was examined. The reported technical progress includes: testing of the corrosion resistance of a turbine flow meter and parametric studies using computerized simulation of a combined thermal photovoltaic concentrating collector, thermal storage tank, absorption air conditioner with auxiliary heater, and a load. Test facility work, including data processing equipment and a cooling load simulator, is reported. DOE

N82-13535# Pacific Northwest Lab., Richland, Wash.

TECHNOLOGY ASSESSMENT OF SOLAR ENERGY SYSTEMS: AVAILABILITY AND IMPACTS OF WOODY BIOMASS UTILIZATION IN THE PACIFIC NORTHWEST

W. J. Hopp, A. D. Chockie, and K. J. Allwine Sep. 1981 57 p refs

(Contract DE-AC06-76RL-01830)

(DE82-000705; PNL-3933) Avail: NTIS HC A04/MF A01

The biomass resource base in the Northwest were estimated. Scenarios and a preliminary analysis in the collection and use of forest residues as an energy resource are presented. Four issues that may serve to constrain the total amount of wood residues available for use as fuel are reviewed. DOE

N82-13536# Oak Ridge National Lab., Tenn. Energy Div.

BUILDING A CONSENSUS ABOUT ENERGY TECHNOLOGIES

T. J. Wilbanks Sep. 1981 12 p refs

(Contract W-7405-eng-26)

(DE82-000501; ORNL-5784) Avail: NTIS HC A02/MF A01

The making and sustaining of major energy policy decisions are considered. The major policy alternatives for making energy decision-making more effective are outlined. The focus is on relatively large decisions about energy technologies. The policy alternatives are characterized as being either focused on technology or on social action. Technology focused options include technology choices and improvements. Social action focused options include information, incentives, legitimacy, and institutional changes. But it is clear that they pose several basic philosophical questions, such as whether to base decisions on strong central leadership or on broad consensus formation. And it is clear that the options vary in being best suited for business as usual situations or emergency decision making situations. DOE

N82-13537# *Minnesota Univ., Minneapolis. Dept. of Electrical Engineering.*

TECHNIQUES FOR ENERGY CONSERVATION IN AC *MOTOR-DRIVEN SYSTEMS* Final Report

N. Mohan Sep. 1981 169 p refs Sponsored by Electric Power Research Inst.

(EPRI Proj. 1201-13)

(DE82-900356; EPRI-EM-2037) Avail: NTIS HC A08/MF A01

Techniques for energy conservation of reducing losses in ac motor driven systems were compared. The impact on electric utility system as a harmonics, power factor of operation, and Electro Magnetic Interference (EMI) is considered. The techniques evaluated are: (1) the NASA Power Factor Controller, a simple device for reducing power losses in lightly loaded ac motors; (2) wanlass motor modification, a scheme of reconnecting motor windings with capacitors in series, to improve the motor efficiencies under all loading conditions; (3) conventional variable frequency solid state inverters which control the speed of ac motors by producing adjustable frequency ac voltage; and (4) frequency drives and schemes including cycloconverters, slip recovery scheme, Exxon Alternating Current Synthesizer, Venturini conversion technique, permanent magnet synchronous motors, and the Phase Liner device. DOE

N82-13538# Oak Ridge Associated Universities, Tenn. Labor and Policy Studies Program.

***BIOMASS ENERGY SYSTEMS: DESCRIPTIONS AND* EMPLOYMENT REQUIREMENTS FOR TYPICAL OPERATIONS**

S. E. Bell and Joanna R. Little Sep. 1981 90 p

(Contract DE-AC05-76OR-00033)

(DE82-000236; ORAU-185) Avail: NTIS HC A05/MF A01

Operations related to biomass energy feasibility studies, and expert opinion which as the basis for the typical facility description and employment estimates are reported. Biomass energy facilities are small by comparison to other energy sector operations, they have a sizable impacts on the communities and regions in which they are located. The employment and earnings generated during construction, operation, and maintenance provide an important stimulus to local economies. The facility descriptions estimated

employment and earnings implications provide a first approximation of what is expected as the use of biomass energy systems increases. DOE

N82-13539# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

NEW AND RENEWABLE ENERGY IN THE UNITED STATES OF AMERICA

Jun. 1981 115 p To be presented at the 1981 United Nations Conf. on New and Renewable Sources of Energy Sponsored in part by the State Dept.

(Contracts EG-77-C-01-4042; DE-AC02-77CH-00178)

(DE81-030887; DOE/S-00012) Avail: NTIS HC A06/MF A01

The current technical and economic status of technologies and with and expectations for new and renewable energy sources in the United States are described. The roles of the public and private sectors in developing and using these energy sources are outlined. Specific technologies discussed are: low, intermediate, and high temperature solar collectors; biomass, wind, and ocean energy systems; hydropower; geothermal systems; oil shale; and tar sands. DOE

N82-13540# Midwest Research Inst., Golden, Colo.

DEVELOPMENT OF HIGH-EFFICIENCY CASCADE SOLAR CELLS Annual Report, Jul. 1980 - Jun. 1981

M. L. Timmons, S. M. Bedair, J. A. Hutchby, J. R. Hauser, and M. Simons Jul. 1981 89 p refs Prepared in cooperation with Research Triangle Inst., Research Triangle Park, N.C. and North Carolina State Univ., Raleigh

(Contract DE-AC02-77CH-00178)

(DE81-029633; SERI/PR-8136-1-T5) Avail: NTIS HC A05/MF A01

Two junction cascade solar cells in two different semiconductor mateials systems: AlGaAs/GaAs and AlGaAsSb/GaAsSb are developed. Liquid phase epitaxy is used to fabricate experimental cascade cells in both of these materials systems. Organometallic/chemical vapor deposition growth technology is studied. DOE

N82-13541# Dynatech Corp., Cambridge, Mass.

BIOMETHANATION OF BIOMASS PYROLYSIS GASES Final Report

C. A. Tracy and E. Ashare Aug. 1981 130 p

(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)

(DE82-000238; SERI/TR-98356-1) Avail: NTIS HC A07/MF A01

The development of the biological methanation process and conditions for maximum performane were studied. Gasification processes have the potential to produce a synthesis gas from biomass. The advantage of such processes is that all organic components of the biomass may be converted to synthesis gas. However, this low Btu value gas is of limited use as a fuel gas. To convert the synthesis gas into pipeline qulity methane, a methanation process is necessary. A more economical alternative to catalytic methanation at high temperature and pressure is the utilization of a biological system to carry out the conversion of biomass pyrolysis gases to methane. DOE

N82-13542# Arkansas Univ., Fayetteville. Dept. of Chemical Engineering.

ECONOMIC AND KINETIC STUDIES OF THE BIOLOGICAL PRODUCTION OF FARM ENERGY AND CHEMICALS FROM BIOMASS Annual Progress Report, Mar. 1979 - Aug. 1980

J. L. Gaddy Aug. 1981 119 p refs

(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)

(DE82-000044; SERI/TR-98020-1) Avail: NTIS HC A06/MF A01

The technical and economic feasibility of producing farm energy from cellulosic residues is investigated. The system has the capacity to produce 1300 CF of biogas and 180 kwh per day, using four parallel batch anaerobic digesters which are agitated mechanically and heated with waste heat from the generator. This system utilizes native grasses as the raw material. Laboratory reactors are operated to determine the proper innoculation ratio for starting batch cultures with cellulosic raw materials. Procedures for startup and operation of batch digestion systems are presented. Energy and economic analyses of the operation of the test unit are performed. The fertilizer potential of anaerobic digester sludge (from agricultural residues) is determined. The feasibility of separating the stages of anaerobic digestion, the production of acetic and propionic acids by the microorganism Propionibacterium acidi-propionici, the production of methane from acid hydrolyzates, and the kinetics of the continuous digestion of corn stover are studied. DOE

N82-13543# California Univ., Livermore. Lawrence Livermore Lab.

DESIGN AND TEST OF TWO-STEP SOLAR OIL SHALE RETORT

D. W. Gregg, R. W. Taylor, W. R. Aiman, and R. Ruiz 24 Sep. 1981 35 p refs

(Contract W-7405-eng-48)

(DE82-000964; UCID-19199) Avail: NTIS HC A03/MF A01

A design of a two step solar retort, the logic for the design, and the results from a preliminary test of the design at the White Sands Solar Furnace, New Mexico are presented. Solar retorting of oil shale is a technically feasible process where focused solar energy can displace fossil energy in the production of liquid fuels. The predicted result is a 10 to 40% improvement in the exportable fuel (oil + gas) production per ton of raw shale. Greater improvements are achieved with the lower grade shales where with nonsolar processes a larger fraction of the fuel content has to be used in the processing. DOE

N82-13544# Public Service Co. of Indiana, Plainfield.

COMPRESSED AIR ENERGY STORAGE: PRELIMINARY DESIGN AND SITE DEVELOPMENT PROGRAM IN AN AQUIFER. VOLUME 2: UTILITY SYSTEM PLANNING Final Report

31 Jul. 1981 112 p refs Sponsored in part by EPRI

(Contracts DE-AC02-78ET-29232; ET-78-C-01-2159; EPRI Proj. 1081-3)

(DE82-000466; DOE/ET-29232/T4-Vol-2) Avail: NTIS HC A06/MF A01

The performance of an aquifer compressed air energy storage system was studied. The benefits derived from the integration of a compressed air energy storage facility with a hypothetical electrical network are analyzed. Scenarios of 100 percent coal, 50 percent coal and 50 percent nuclear, and 100 percent nuclear base load capacity additions were examined. Favorable economics are indicated when compressed air energy storage is installed as an alternative to combustion turbine peaking capacity on a system with a significant amount of oil fired generation. DOE

N82-13545# Pau Univ. (France).

MICROEMULSIONS, EMULSIONS AND RELATED SYSTEMS: ENERGY APPLICATIONS [MICROEMULSIONS, EMULSIONS ET SYSTEMES CONNEXES: APPLICATIONS ENERGETIQUES]

1980 29 p refs In FRENCH Presented at Journee d'Etudes on Emulsions, Microemulsions et Systemes Connexes, Agents de Recuperation, de Stockage et de Transformation d'Energie, Pau, France, 25 Jan. 1980

Avail: NTIS HC A03/MF A01

Summaries of 16 lectures are presented. Topics include: oil recovery, thermodynamics of surface-active agents and microemulsions, interpretation of properties particular to alcohols in water-alcohol-oil ternary systems, phase diagrams and interfacial properties of the system water-dodecane-pentanol-sodium octylbenzene sulfonate, and modeling structural inversion in microemulsions. Other subjects are: numerical study of diphasic one and two dimensional flow in a porous medium, storage and transport of low temperature thermal energy as latent heat in dispersed systems, and the dynamics of nonNewtonian solutions. Author (ESA)

N82-13548# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

DEVELOPMENT AND OPTIMIZATION OF HYDROGEN STORAGE MATERIALS USING SURFACE ANALYTICAL TECHNIQUES [ENTWICKLUNG UND OPTIMIERUNG VON HYRIDSPEICHER-MATERIALIEN UNTER EINSATZ GRENZFLAECHENPHYSIKALISCHER ANALYSEVERFAHREN]

E. Hamer, W. Gerhard, C. Plog, and H. W. Schroeder Bonn Bundesministerium der Verteidigung 1980 96 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium

der Verteidigung
(BMVg-FBWT-80-6) Avail: NTIS HC A05/MF A01; DOK-ZENTBw, Bonn DM 30

The role of surface characteristics and properties in the hydrogen storage capability of various materials is studied and optimization proposals are formulated. The hydration properties of FeTi, LaNi5 and Mg/Ni-alloys are correlated with surface data from secondary ion mass spectroscopy and Auger electron spectroscopy as well as with a complementary volume characterization. The hydrogen dissociation catalysis at the surface provoked by oxygen-induced segregation is confirmed. The uptake of CO by the surface is investigated and the expected poisoning influence of contamination is discussed. Among the optimization proposals, the influence of palladium coating and selection through correlation between hydration properties and magnetic properties of the different materials were experimentally assessed. Author (ESA)

N82-13547# Horstmann G.m.b.H., Heiligenhaus (West Germany).
A CENTRAL MICROPROCESSOR CONTROLLED ELECTRICAL STORAGE HEATING SYSTEM Final Report
Hendrik Horstmann Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 26 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-182; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5.50

The use of a microprocessor to control the reloading of electrical storage heaters not only during the night, but whenever the electrical grid is cycled down, was tested. The test setup, used to control a total of about 10 MW installed storage heating in 96 dwellings, is described. It is demonstrated that additional consumers can be connected to the system without demand for more power stations. Author (ESA)

N82-13548# Swedish Inst. for Materials Testing, Boras. Lab. foer Ytskydd och Korrosion.
AGING AND CORROSION PROBLEMS WITH FLAT SOLAR ENERGY ABSORBERS. STUDY BASED UPON LITERATURE AND EXPERIMENT EXCHANGES [AALDRINGS-OCH KORROSIONS-PROBLEM HOS PLANA TERMISKA SOLFAANGARE. EN STUDIE BASERAD PAA LITTERATUR OCH ERFARENHETSUTBYTE]
Hans Wennerholm and Knut-Olof Lagerkvist 1979 72 p refs In SWEDISH
(SP-RAPP-1979/4) Avail: NTIS HC A04/MF A01

The construction and the causes of damage to solar energy absorbers are reviewed. Aging is due to ultraviolet radiation, temperature, humidity, oxygen, impurities in the air and other effects. A literature review is given about the constituent parts. The coverplate may be of glass, several types of plastics, fluoro-compounds, fiberglass, or silicones. For the absorbing surface, sintered chromium oxide, black nickel, black iron, copper oxide, manganese oxides, or selective coated alumimium are used. The insulation is often made of mineral wool or polyurethane resins. Inspection data are reported for nine solar flat-shaped energy absorbers. Most of them are used for the production of warm water and have been in use between three months and three years. Nearly all coverplates bore important deposits caused by condensation. Some of the nine aborbers show corrosion on the aborbing surface and/or on insulation. Author (ESA)

N82-13549# National Bureau of Standards, Washington, D.C.
PASSIVE/HYBRID SOLAR COMPONENTS: AN APPROACH TO STANDARD THERMAL TEST METHODS
M. E. McCabe, W. Ducas, M. J. Orloski, and K. N. Decorte Jul. 1981 87 p refs Sponsored in part by DOE
(PB81-227886; NBSIR-81-2300) Avail: NTIS HC A05/MF A01 CSCL 14B

A survey of passive solar products currently available or under development enabled the development of an interim classification system consisting of ten component classifications for purposes of thermal testing. A survey of currently available thermal test procedures was performed to assess the applicability of these test methods for passive/hybrid solar components. Existing test procedures that are useful for the direct gain fenestration system classification are identified, and recommendations are made for evaluation of these laboratory-based procedures by comparison with field-based testing of components under controlled interior conditions. Recommendations are also made for the development of new test procedures for passive/hybrid components classifications for which existing test methods are not applicable. GRA

N82-13550 Stanford Univ., Calif.
ELECTRICAL EFFECTS OF SLAG IN A DIFFUSE MODE MAGNETOHYDRODYNAMIC GENERATOR Ph.D. Thesis
Ron Michael Nelson 1981 181 p
Avail: Univ. Microfilms Order No. 8124118

A high temperature (1900 K) platinum-rhodium capped magnesia electrode was developed and successfully tested in a slagging MHD generator. Diffuse mode (non-arcing) operation of high temperature anodes was achieved at current densities up to 3 amps sq cm2. The problem of cathode shorting caused by the ionic nature of slag electrical conductivity (with iron as the major mobile species) was not substantially alleviated by high temperature operation. A computer code was developed which solves the governing electrical equations along with slag energy and thickness equations for a two dimensional, periodic electrode pair in a slagging MHD generator. The numerical results compare favorably with the experimental results including cases with shorted cathode walls. The computer model was used to assess the effects of slag and other operating parameters on generator performance. Dissert. Abstr.

N82-13551 Delaware Univ., Newark.
DESIGN PROCEDURES FOR A COMMERCIAL SCALE THERMAL EVAPORATION SYSTEM TO DEPOSIT CdS FOR SOLAR CELL MANUFACTURE Ph.D. Thesis
Richard Edward Rocheleau 1981 422 p
Avail: Univ. Microfilms Order No. 8123800

The detailed process and equipment design of a pilot scale system for continuous deposition of photovoltaic quality cadmium sulfide on a flexible moving substrate was carried out. The unit was built to the design specifications, and operated to demonstrate the feasibility of continuously depositing the semiconductor layer for solar cell manufacture. Model equations and constitutive flow equations describing the effusion of CdS from a source used for solar cell fabrication were verified by experiment. Dissert. Abstr.

N82-13552 Delaware Univ., Newark.
ELECTRON BEAM-INDUCED CURRENT (EBIC) MEASUREMENTS OF HEAT TREATED POLYCRYSTALLINE CUPROUS SULFIDE/CADIMUM SULFIDE SOLAR CELLS Ph.D. Thesis
Stephen Patrick Shea 1981 121 p
Avail: Univ. Microfilms Order No. 8123801

The EBIC response was measured after the samples were heat treated in hydrogen at 170 C for times between zero and 225 hours. The magnitude of the EBIC varied greatly, in some cases by as much as three orders of magnitude, across the active surface of the heat treated samples. Also, the EBIC was not a linear function of the electron beam power, as predicted by a simple theory of the experiment. These observations are explained by a model which accounts for the effects of copper diffusion from the CU2 sub s into the CdS during heat treatment. The rate of diffusion is found to be different in different areas of each sample, possibly because of a variation in the diffusion constant in grains with different crystallographic orientations. Models of both the EBIC and the dark, zero-bias capacitance of these devices are presented which support this interpretation of the data. Dissert. Abstr.

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N82-13553# Finnish Meteorological Inst., Helsinki.
SULFUR IN THE AIR IN THE CAPITAL (HELSINKI) METROPOLITAN AREA: ITASAT-PROJECT Final Report [PAEAEKAUPUNKISEUDUN ILMAN RIKKI ITASAT-PROJEKTIN LOPPURAPORTTI]

Markku Wallin, Eija Lumme, Markku Hietamaeki, and Erkki Rantakrans 1981 86 p refs In FINNISH
(RR-614.71) Avail: NTIS HC A05/MF A01

Methods for regionally producing and processing information about air quality, air protection measures, and determining alternative examples for air protection solutions are assessed. The sulfur dioxide content of air is predicted. The effects of various air protection measures and their cost (flue gas desulfurization, use of low sulfur heavy fuel oil) are compared. S.L.

N82-13554*# United Air Lines, Inc., San Francisco, Calif. Maintenance Operations Center.
AN AUTOMATED SYSTEM FOR GLOBAL ATMOSPHERIC SAMPLING USING B-747 AIRLINERS Final Report
Ken Q. Lew, Ulf R. C. Gustafsson, and Robert E. Johnson Oct. 1981 31 p refs
(Contract NAS3-17867)
(NASA-CR-165264; UAL-C-80-31-33) Avail: NTIS HC A03/MF A01 CSCL 13B

The global air sampling program utilizes commercial aircrafts in scheduled service to measure atmospheric constituents. A fully automated system designed for the 747 aircraft is described. Airline operational constraints and data and control subsystems are treated. The overall program management, system monitoring, and data retrieval from four aircraft in global service is described. E.A.K.

N82-13555# Naval Postgraduate School, Monterey, Calif. Dept. of Oceanography.
ECOLOGY AND DISTRIBUTION OF THE BENTHIC COMMUNITY ON THE MONTEREY BREAKWATER, MONTEREY, CALIFORNIA M.S. Thesis
Steven J. Busch Mar. 1981 130 p refs
(AD-A102047) Avail: NTIS HC A07/MF A01 CSCL 06/6

The Monterey breakwater was studied to determine an ecological baseline. The plants and animals occupying meter square quadrats along a cross sectional transect covering the breakwater and the adjacent mud bottom out to depths of 13 meters was surveyed qualitatively and quantitatively. It is found that the differences between the populations of the inner and outer parts of the breakwater is minor and those differences are in the relative abundance of only a few species. Author

N82-13556# Oak Ridge National Lab., Tenn. Chemical Technology Div.
CONCENTRATION OF ORGANIC COMPOUNDS IN WATER: A LITERATURE SURVEY
R. L. Jolley 1980 23 p refs Presented at the Workshop on Protocol Develop.: Criteria and Standards for Potable Reuse and Feasible Alternatives, Warrenton, Va., 29-31 Jul. 1980
(Contracts EPA-IAG-D7-01027; W-7405-eng-26)
(DE81-026517; CONF-8007111-1) Avail: NTIS HC A02/MF A01

Because of the large variety of chemical compounds present either naturally or as industrial contaminants is water samples, no single concentration method currently available is adequate for concentrating all organics in the water sample. Consequently, in an attempt to concentrate or isolate as much of the organic matter as possible, most researches have combined several methods that may become quite complex and technically difficult to achieve. Most of the current practical methods are summarized in a table and the utility of each method along with major advantage and disadvantages are presented. T.M.

N82-13557# Brigham Young Univ., Provo, Utah. Dept. of Chemistry.
PROTON-INDUCED X-RAY EMISSION ANALYSIS: A COMPLEMENT TO ANALYTICAL METHODS USED IN ENVIRONMENTAL STUDIES
N. F. Mangelson, D. J. Eatough, N. L. Eatough, L. D. Hansen, M. W. Hill, M. L. Lee, L. R. Phillips, M. E. Post, B. E. Richter, and J. F. Ryder 1980 5 p refs Presented at the 6th Conf. on the Appl. of Accelerators in Res. and Ind., Denton, Tex., 3-5 Nov. 1980 Submitted for publication
(Contract DE-AC02-80EV-10405)
(DE81-029012; DOE/EV-10405/4; CONF-801111-50) Avail: NTIS HC A02/MF A01

Two projects where particle induced X-ray emission was used in conjunction with titration calorimetry, ion chromatography, atomic absorption spectroscopy, gas chromatography/mass spectrometry, X-ray fluorescence spectroscopy are reported. Sulfur chemistry in a copper smelter was explored. Arsenic is a conservative tracer of the plume and is used for calculation of plume dilution. Calcium is characteristic of the background or ambient aerosol aerosol and is used to correct particulate data for the background contribution. was also studied. The scrubber water and particulate matter entrained in the scrubber water and in the product gas are analyzed by PIXE. It is found that scrubber water has low elemental concentrations. DOE

N82-13558# Oak Ridge Associated Universities, Tenn. Inst. for Energy Analysis.
RESPONSE OF THE OCEANS TO INCREASING ATMOSPHERIC CARBON DIOXIDE
C. F. Baes, Jr. Aug. 1981 72 p refs
(Contract DE-AC05-76OR-00033)
(DE81-028178; ORAU/IEA-81-6(M)) Avail: NTIS HC A04/MF A01

The relevant physical and chemical features of the ocean, the observational evidence of its response to increasing atmospheric carbon dioxide, and the uncertainties involved in modeling this response are considered. The deep oceans are near saturation with calcite. The pressure dependence of this solubility and ocean circulation produces calcite supersaturation of the upper ocean. This condition is maintained by photosynthesis and the biogenically controlled precipitation of calcium carbonate. After correcting the effects of biological processes on the composition of seawater, it is evident that the increasing carbon dioxide content of the atmosphere affects the distribution of carbon in the upper ocean. DOE

N82-13559# Mathtech, Inc., Princeton, N. J.
ENVIRONMENTAL IMPACTS OF ENERGY TRANSPORTATION Final Report
J. P. Price Electric Power Research Inst. Sep. 1981 243 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. TPS-76-661)
(DE82-900316; EPRI-EA-2039) Avail: NTIS HC A11/MF A01

The environmental impacts of fuel transportation for the electric utility industry are reviewed. The transportation of coal, oil, natural gas, liquified natural gas methanol and hydrogen are covered. The major impacts coal unit trains are: the creation physical barriers, potential accidents, and noise. It is indicated that more emphasis should be placed on the evaluation of the environmental socio-economic impacts of fuel transportation. DOE

N82-13560# Oak Ridge National Lab., Tenn.
CONTROL OF HYDROCARBONS AND CARBON MONOXIDE VIA CATALYTIC INCINERATION
C. H. Brown, Jr. and J. A. Klein Sep. 1981 113 p refs
(Contract W-7405-eng-26)
(DE82-000508; ORNL/TM-7787) Avail: NTIS HC A06/MF A01

Eight commercially available incineration catalysts are evaluated experimentally to assess their application to control hydrocarbon and carbon monoxide emissions in the tail gases from a Lurgi substitute natural gas plant, which is simulated using bottled gas mixtures. Catalysts are evaluated with respect to the effects of temperature, space velocity, and the presence of hydrogen sulfide and carbonyl sulfide on hydrocarbon and carbon monoxide conversion. The most effective catalysts are a precious metal based catalyst on a monolithic substrate and a nonprecious metal oxide deposited on a solid substrate formed into 3.2 mm diameter spheres. DOE

N82-13561# California Univ., Berkeley. Lawrence Berkeley Lab. Energy an Environment Div.
INFILTRATION AND INDOOR AIR QUALITY IN ENERGY EFFICIENT HOUSES IN EUGENE, OREGON
R. D. Lipschutz, J. R. Girman, J. E. Dickinson, J. R. Allen, and G. W. Traynor Aug. 1981 50 p refs
(Contract W-7405-eng-48)
(DE82-000971; LBL-12924) Avail: NTIS HC A03/MF A01

Infiltration rates and indoor pollutant levels in houses

incorporating energy conserving measures which provide information about the effectiveness and health effects were measured. Twelve energy efficient houses were measured for effective leakage area using blower door fan pressurization. Air exchange rates were determined by tracer gas decay analysis. The measurements were used in conjunction with the LBL infiltration model to predict average annual and heating season infiltration rates. Indoor concentrations of radon, formaldehyde, and nitrogen dioxide were measured. DOE

N82-13562# Wisconsin Univ., Madison. Dept. of Bacteriology.
ENERGY GENERATION AND THE SULFUR-CARBON CYCLE Progress Report
1981 3 p refs
(Contract DE-AS02-76EV-02161)
(DE81-030949; DOE/EV-02161/T1) Avail: NTIS HC A02/MF A01

The dynamics of sulfate and sulfide water chemistry are compared. Approximately 50 percent of the reduced endogenous carbon (i.e. algal biomass) is mineralized via sulfate reduction and 50 percent via methanogenesis. Radioactive tracer studies with (S-35)04(=) establish that most of the endogenous carbon mineralized via sulfate reduction occur in the surface sediments (1-4 cm). The quantitative importance of S04(=) reduction in carbon mineralization (i.e., 50 percent of endogenous carbon is mineralized anaerobically via sulfate reduction) is confirmed. Sulfate reduction is not limited by in situ sulfate concentration (i.e., 1 mM) in suface sediments. S.L.

N82-13563# Meteorology Research, Inc., Santa Rosa, Calif.
AIRCRAFT DATA SUMMARIES FOR THE SURE INTENSIVES, VOLUME 6 Final Report
W. S. Keifer, D. L. Blumenthal, J. B. Tommerdahl, J. A. McDonald, R. B. Strong, and J. H. White Sep. 1981 184 p Sponsored by Electric Power Research Inst. Prepared in cooperation with Research Triangle Inst., Research Triangle Park, N.C.
(EPRI Proj. 862)
(DE82-900355; EPRI-EA-1910-Vol-6) Avail: NTIS HC A09/MF A01

As part of the EPRI sulfate regional experiment (SURE), six air quality sampling programs were conducted in the eastern United States using instrumented aircraft. The air quality and meteorological data was obtained during the October 1978 sampling. Sampling data are presented for all measured parameters. T.M.

N82-13564 Meteorology Research, Inc., Santa Rosa, Calif.
TABLES OF STATISTICAL SUMMARIES FOR THE SURE AIRCRAFT MEASUREMENTS Final Report
D. L. Blumenthal, W. S. Keifer, and J. A. McDonald Sep. 1981 213 p Sponsored by Electric Power Research Inst.
(EPRI Proj. 862)
(DE82-900317; EPRI-EA-1911) Avail: NTIS HC A10/MF A01

During the sulfate regional experiment (SURE), two aircraft simultaneously measured the vertical distribution of air pollutants and meteorological parameters for a total of six two-week periods in the vicinity of various SURE air monitoring stations in the notheast US. During all periods, the aircraft were based at least 200 km apart. In general, flights consisted of a set of three spirals between the surface (or minimum legal flight altitude) and 3000 m msl. For each vertical spiral, statistics were calculated separately for those data above and below 1500 m msl. For each pollutant parameter and spiral segment, the mean value (anti x), the standard deviation (S), and the coefficient of variation (S/anti x) have been calculated. DOE

N82-13565# Los Alamos Scientific Lab., N. Mex.
ENVIRONMENTAL AND RADIOLOGICAL SAFETY STUDIES: INTERACTION OF (238) PuO2 HEAT SOURCES WITH TERRESTRIAL AND AQUATIC ENVIRONMENTS Quarterly Progress Report, 1 Jan. - 31 Mar. 1981
Glenn R. Waterbury (comp.) Sep. 1981 42 p refs
(Contract W-7405-eng-36)
(DE81-032019; LA-8932-PR) Avail: NTIS HC A03/MF A01

The effects on the heat source of terrestrial and aquatic environments to obtain data for design of even safer systems were studied. Data obtained in several ongoing experiments are presented and include data from environmental chamber experiments that simulate terrestrial conditions, experiments to measure PuO2 dissolution rates, soil column experiments to measure sorption of plutonium by soils, and aquatic experiments. DOE

N82-13566# Pacific Northwest Lab., Richland, Wash.
TREATMENT OF BIOMASS GASIFICATION WASTEWATERS USING REVERSE OSMOSIS
S. E. Petty, S. D. Eliason, and M. M. Laegreid Sep. 1981 44 p refs
(Contract DE-AC06-76RL-01830)
(DE82-000698; PNL-4018) Avail: NTIS HC A03/MF A01

Reverse osmosis (RO) as a treatment technology for the removal of organics from biomass gasification wastewaters (BGW) generated from an experimental biomass gasifier was evaluated. Since RO is normally considered a complementary treatment technology, wastewaters were pretreated by biological or wet air oxidation (WAO) processes. This membrane is similar to the NS-100, a membrane which is effective in the separation of organics from solution. Separation of organics from solution was determined by COD removal. Membrane degradation was observed when using full strength and WAO pretreated feeds, but not when using feeds that had undergone biological pretreatment. Color removal was computed for the majority of experiments completed. DOE

N82-13567# Pacific Northwest Lab., Richland, Wash.
TREATMENT OF BIOMASS-GASIFICATION WASTEWATERS BY WET-AIR OXIDATION
C. J. English Sep. 1981 30 p refs
(Contract DE-AC06-76RL-01830)
(DE82-000935; PNL-4013) Avail: NTIS HC A03/MF A01

Production of synthetic natural gas from gasification of biomass results in the generation of a high strength wastewater that is difficult to treat by conventional means. The use of wet air oxidation (WAO) as a treatment method for wastewaters was studied. It is suggested that oxidation of biomass gasification wastewaters (BGW) organics by WAO occurs in a stepwise fashion with large organic molecules first beng hydrolyzed and then partially oxidized to low molecular weight intermediates. Complete oxidation of these intermediates is more difficult and most easily accomplished at high reaction temperatures. The best application of WAO to treatment of BGW appears to be as a pretreatment to biological treatment. DOE

N82-13568# Meteorology Research, Inc., Santa Rosa, Calif. Environmental Physics and Chemistry Program.
AIRCRAFT DATA SUMMARIES FOR THE SURE INTENSIVES, VOLUME 1 Final Report
D. L. Blumenthal Sep. 1981 160 p Sponsored by Electric Power Research Inst. Prepared in cooperation with Research Triangle Inst., Research Triangle Park, N. C.
(EPRI Proj. 862)
(DE82-900314; EPRI-EA-1910-Vol-1) Avail: NTIS HC A08/MF A01

Six air quality sampling programs in the eastern United States using instrumented aircraft were conducted as part of the sulfate regional experiment. The air quality and meteorological data were obtained from samples near the Rockport, Indiana and near the Duncan Falls, Ohio. Sampling data are presented for all measured parameters. DOE

N82-13569# Meteorology Research, Inc., Santa Rosa, Calif.
AIRCRAFT DATA SUMMARIES OF THE SURE INTENSIVES, VOLUME 4 Final Report
W. S. Keifer, D. L. Blumenthal, J. B. Tommerdahl, J. A. Anderson, J. A. McDonald, R. B. Strong, and J. H. White Sep. 1981 190 p Sponsored by Electric Power Research Inst. Prepared in cooperation with Research Triangle Inst., Research Triangle Park, N.C.
(EPRI Proj. RP-862)
(DE82-900311; EPRI-EA-1019-Vol-4) Avail: NTIS HC A09/MF A01

As part of the sulfate regional experient (SURE), six air quality sampling programs were conducted in the eastern United States using instrumented aircraft. The air quality and meteorologi-

cal samples were taken near the Duncan Falls, Ohio sulfate regional experiment (SURE) Station and near the Research Triangle Park, North Carolina, SURE Station. Sampling data are presented for all measured parameters. DOE

N82-13570# Meteorology Research, Inc., Santa Rosa, Calif. Environmental Physics and Chemistry Program.
AIRCRAFT DATA SUMMARIES OF THE SURE INTENSIVES, VOLUME 5 Final Report
W. S. Keifer, D. L. Blumenthal, J. B. Tommerdahl, J. A. McDonald, R. B. Strong, and R. H. White Sep. 1981 275 p Sponsored by Electric Power Research Inst. Prepared in cooperation with Research Triangle Inst., Research Triangle Park, N.C.
(EPRI Proj. 862)
(DE82-900310; EPRI-EA-1910-Vol-5) Avail: NTIS HC A12/MF A01

Six air quality sampling programs in the eastern United States using instrumented aircraft were conducted. The air quality and meteorological data were obtained during the July 1978 Intensive sampled near the Duncan Falls, Ohio, and near Scranton, Pennsylvania. Aircrafts participated in a large regional scale sampling program during the last part of the July 1978 sampling period. DOE

N82-13571# Service de la Programmation de la Politique Scientifique, Brussels (Belgium).
NATIONAL RESEARCH AND DEVELOPMENT PROGRAM: ENVIRONMENTAL AIR. SUMMARY Final Report, 1975-1978 [PROGRAMME NATIONAL R-D: ENVIRONNEMENT AIR]
1979 40 p In FRENCH Original contains color illustrations
Avail: NTIS HC A03/MF A01

The air quality in and around Gent, Belgium, was studied. Results presented cover pollution transport, epidemiology (pulmonary and respiratory diseases), and measures of interior versus exterior contaminant concentrations. Modeling software for meteorology, emissions monitoring, methodology of environment monitoring, and the economic implications of the fight against air pollution are also discussed. Author (ESA)

N82-13572# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Weather Research and Modification.
ENVIRONMENTAL EFFECTS OF POLLUTANTS FROM COAL COMBUSTION. 1: THE FOUR CORNERS POWER PLANT, FARMINGTON, N.M.
R. F. Pueschel, Y. Mamane, C. C. VanValin, W. E. Cobb, F. P. Parungo, and D. L. Wellman Apr. 1981 86 p refs 2 Vol.
(Contract EPA-IAG-D5-E693)
(PB81-230427; NOAA-TM-ERL-OWRM-2; NOAA-81062608)
Avail: NTIS HC A05/MF A01 CSCL 13B

Cloud condensation nuclei (CCN) were formed in the plume of a power plant and CCN concentrations were found to increase with increasing distance of up to 80 km from the power plant. Condensation nuclei (CN) were also formed. The greatest concentrations of CN were found at distances of less than 40 km downwind, although the total CN population was greater at the greater distances. The size distribution measurements show a gradually increasing modal radius and increasing concentrations of the accumulation mode with increasing distances. Most particles are sulfates, and most larger particles are fly ash. It is suggested that there is a relationship between concentration of surface deposited sulfate and inverse particle diameter and that sulfur is adsorbed and oxidized on refractory fly ash in the high temperature zone of the boiler. GRA

N82-13573# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Weather Research and Modification.
ENVIRONMENTAL EFFECTS OF POLLUTANTS FROM COAL COMBUSTION. 2: THE COLSTRIP, MONTANA POWER PLANT
C. C. VanValin, R. F. Pueschel, and D. L. Wellman Apr. 1981 70 p refs 2 Vol.
(Contract EPA-IAG-D5-E693)
(PB81-234114; NOAA-TM-ERL-OWRM-3; NOAA-81062609)
Avail: NTIS HC A04/MF A01 CSCL 13B

Aerosol samples from the plume of a power plant were analyzed for the presence of sulfates and nitrates with the transmission electron microscope using the BaCl2 and Nitron tests. Plume profile were measured for width and thickness. Tracking of the plume of the Colstrip power plant plume with the aircraft provided plume trajectories that were influenced by the underlying terrain by being diverted by as much as 20 from the wind direction at plume altitude, or by being ducted along a valley. It is indicated that there is no difference in ice nucleus concentrations between plume and ambient atmosphere, and the latter shows an increase of an order of magnitude. GRA

N82-13574# Louisiana State Univ. and A&M Coll., Baton Rouge. Lab. for Wetland Soils and Sediments.
NITROGEN AND PHOSPHORUS REACTIONS IN OVERLAND FLOW OF WASTEWATER Final Report, Mar. 1975 - Jun. 1979
R. A. Khalid, I. C. R. Holford, M. N. Mixon, and W. H. Patrick, Jr. Aug. 1981 192 p refs
(Grant EPA-R-803612)
(PB81-239311; EPA-600/2-81-150) Avail: NTIS HC A09/MF A01 CSCL 13B

Biochemical transformations of labelled ammonium-nitrogen and nitrate-nitrogen resulting from the overland flow treatment of simulated wastewater were studied. The factors controlling the nitrification and denitrification are discussed and the ultimate fate of the nitrogen species are determined. The mechanisms of phoshorus sorption and desorption are investigated under both laboratory an overland flow conditions. GRA

N82-13575# Monsanto Research Corp., Dayton, Ohio.
HIGH ALTITUDE TESTING OF RESIDENTIAL WOOD-FIRED COMBUSTION EQUIPMENT Final Report
J. A. Peters and D. G. DeAngelis Jan. 1981 48 p refs
(Contract EPA-68-03-2550)
(PB81-226151; EPA-600/2-81-127) Avail: NTIS HC A03/MF A01 CSCL 13B

A high altitude sampling program was conducted which was compared to previously collected low altitude data. To determine whether emissions from operating a wood stove at high altitude differ from those at low altitude. Emission tests were conducted in the identical model stove using the same type of wood with the same moisture content, amount of wood charged, burning rate, air flow rate, and identical sampling intervals and port locations. Particulate emissions, carbon monoxide, and polycyclic organic matter were analyzed. GRA

N82-13576# Research Triangle Inst., Research Triangle Park, N. C.
ENVIRONMENTAL HAZARD RANKINGS OF POLLUTANTS GENERATED IN COAL GASIFICATION PROCESSES Final Report, Feb. - Apr. 1980
J. G. Cleland Jun. 1981 400 p refs
(Contract EPA-68-02-3170)
(PB81-231698; EPA-600/7-81-101) Avail: NTIS HC A17/MF A01 CSCL 13B

An evaluation and ranking of environmental hazards associated with coal gasification is reported. Applied chemical analytical data were provided by: (1) research with an experimental gasifier; and (2) sampling of four commercial gasification processes. Gas, liquid, tar, and solid streams were analyzed for 300 substances. Hazard potential was measured. Coals tested range from lignite to anthracite. Approximately 50 representative pollutants are emphasized and ranked according to relative environmental hazard potential. GRA

N82-13577 Pennsylvania State Univ., University Park.
AIRCRAFT MEASUREMENTS AND MATHEMATICAL MODELING OF THE REMOVAL OF GASEOUS AIR POLLUTANTS AT NATURAL AIR-LAND AND AIR-WATER INTERFACES Ph.D. Thesis
Anthony Joseph DeCaria 1981 444 p
Avail: Univ. Microfilms Order No. 8120415

Natural removal mechanisms play an important role in determining the ultimate fate of gaseous air pollutants emitted into the Earth's atmosphere. One of the more important natural removal mechanisms is absorption at the Earth's surface. Absorption at the Earth's surface was investigated by field measurements, theoretical developments, and comparative interpretation of the measurements and mathematical models. The field program consisted of aircraft measurements of the concentration profiles of SO2 in a plume from a coal-fired power

plant on the southern shore at Lake Erie. The measurements were restricted to 20 kilometers from the source. These measurements were conducted in an attempt to differentiate removal at air-land and air-water interfaces. There were no apparent differences in measured concentration profiles obtained over land when compared with profiles obtained over water.
Dissert. Abstr.

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N82-13578 West Virginia Univ., Morgantown.
PYROLYTIC CHARACTERIZATION OF THE ORGANIC MATTER IN SELECTED COALS AND IN THE DEVONIAN SHALES OF SOUTHERN WEST VIRGINIA Ph.D. Thesis
Peter Alexander Kelley 1980 275 p
Avail: Univ. Microfilms Order No. 8123953

Selected whole coal samples from the coal sequence in West Virginia and shale samples of the Devonian black shales collected throughout southern West Virginia were subjected to pyrolytic analysis. Pyrograms characteristically showed two main groups of peaks, the first group of peaks representing the volume of hydrocarbons already present in the samples which are volatilized during the heating interval 40 C to 405 C, while the second group of peaks represents the hydrocarbons and related compounds generated during the 405 C to 700 C interval. All coal pyrograms gave a maximum in the pyrolysis curve which occurred in 400 C to 600 C temperature range. The degree of maturation of the organics in the Devonian shale samples was evaluated using the temperature of the maximum hydrocarbon generation during pyrolysis from 405 C to 700 C and the transformation ratio. The peak area units and relative values were used to evaluate the organic richness genetic potential, and hydrocarbon proportions in the Devonian shale samples.
Dissert. Abstr.

N82-13579 California Univ., Los Angeles.
THE TRACE METAL STRATIGRAPHY AND RECENT SEDIMENTARY HISTORY OF ANTHROGENOUS PARTICULATES ON THE SAN PEDRO SHELF, CALIFORNIA Ph.D. Thesis
Kenneth Norman Kettenring, Jr. 1981 173 p
Avail: Univ. Microfilms Order No. 8122820

The County of Los Angeles operates a sewage outfall on the western San Pedro Shelf, with the discharge at 60 meters depth and approximately 2.5 kilometers off White's Point. The outfall provides a point source of metal rich organic debris that is deposited on the shelf in an elongate field running northwest and southeast from the discharger. There are two conflicting hypotheses concerning the fate of outfall particulates and associated elements. The first hypothesis is that more than 60% of the particulates remain on the shelf, but that some of the metals are remobilized after deposition. The second hypothesis is that only a small fraction (less than 1% of the organic carbon) of the particulates is retained on the shelf, and that there is no remobilization. The present study strongly supports the first hypothesis. Sediment samples were collected along the 60 meter contour northwest of the outfall using a box-corer with 29.8 x 20.8 x 61 cm. boxes. Each box was subcored, and the subcores were frozen, cut into 1 cm. segments, and freeze-dried. Concentrations of carbon, copper, cadmium, chromium, nickel, zinc, and lead were measured. Dissert. Abstr.

N82-13580 South Carolina Univ., Columbia.
A DEPOSITIONAL MODEL FOR MAJOR COAL SEAMS IN THE ROCK SPRINGS FORMATION, UPPER CRETACEOUS, SOUTHWEST WYOMING Ph.D. Thesis
Raymond Allen Levey 1981 585 p
Avail: Univ. Microfilms Order No. 8123428

Data from coal exploration drill holes, measured sections, and deep mine maps, in conjunction with cursory examination of oil and gas logs and seismic sections, were used to reconstruct the depositional settings of the Rock Springs Formation in southwestern Wyoming. Depositional regression represented by extensive sheet sandstones are inferred to be delta-front deposits which reflect the cuspate to arcuate geometry of wave-dominated delta deposits. Coal seam discontinuities, represented by areas of reduced coal thickness or by wedges of sediment producing multiple benches or rider coals, are caused by sediment influx from distributary channels, fluvial channels, and splays. Correlation of several members of the Rock Springs Formation is extended along the outcrop and into the subsurface on the west flank, north rim, and northeast flank of the Rock Springs uplift. Analysis of the geometries and spatial distributions of coal seams was used to develop a detailed geologic model. Dissert. Abstr.

N82-13581 California Univ., Santa Cruz.
RECURRENCE INTERVALS AND RECENCY OF FAULTING ALONG THE SAN GREGORIO FAULT ZONE, SAN MATEO COUNTY, CALIFORNIA Ph.D. Thesis
Gerald Eric Weber 1980 277 p
Avail: Univ. Microfilms Order No. 8123250

The San Gregorio fault branches off of the San Andreas fault zone at Bolinas Lagoon, north of the Golden Gate extending in a south-southeasterly direction to the vicinity of Point Sur where it may possibly connect with the Sur-Nacimiento fault that in turn connects with the San Simeon, and Hosgri faults forming a 450 km long coastal boundary fault. Near Point Ano Nuevo in San Mateo County the numerous faults form a zone greater than 3 km in width. Analysis of the Pleistocene faulting near Point Ano Nuevo indicates that the San Gregorio fault zone consists of two primary fault strands, the Frijoles fault and Coastways fault, and numerous small secondary and branch faults. It is suggested tht 240-280 moderate to large faulting events have occurred along the San Gregorio during the past 105,000 years. The recurrence interval for 7.0-7.5 magnitude earthquakes is, therefore, between 325-440 years, a recurrence interval tht compares favorably with the recurrence interval determined from the long term slip rate. Dissert. Abstr.

N82-13582 Northwestern Univ., Evanston, Ill.
THERMAL CONTRACTION AND FLEXURE OF INTRACRATONIC BASINS: A THREE DIMENSIONAL STUDY OF THE MICHIGAN BASIN Ph.D. Thesis
Jeffrey Allen Nunn 1981 363 p
Avail: Univ. Microfilms Order No. 8124965

Surface cooling of heated continental crust imposes a load on the lithosphere which subsides as the basement rocks contract. Accumulation of sediments in the resulting depression forms a sedimentary basin. Studies of the geometry of sedimentary basins with horizontal dimensions of a few hundred kilometers suggests the lithosphere responds to loads by regional flexure of a strong elastic or viscoelastic upper lithosphere. Two and three dimensional models for flexure of the lithosphere due to thermal contraction were applied to the Michigan basin. Lithostratigraphic data were used to quantitatively determine the contribution of the weight of sediment overburden to the subsidence. Thermal contraction load was calculated from the load necessary to produce the observed deflection of the lithosphere minus sediment load. Gravity effects of the models were computed and compared to the observed free air gravity anomalies. Dissert. Abstr.

N82-13583 Stanford Univ., Calif.
THE CRUSTAL STRUCTURE OF KILAUEA AND MAUNA LOA VOLCANOES, HAWAII, FROM SEISMIC REFRACTION AND GRAVITY DATA Ph.D. Thesis
John Justin Zucca 1981 136 p
Avail: Univ. Microfilms Order No. 8124182

Two 100-km-long, on-shore/off-shore seismic refraction profiles were established for Hawaii's two most active volcanoes, Mauna Loa and Kilauea. Combined analysis of these profiles along with the gravity data and teleseismic P-wave residuals for the profiles suggest a complicated crustal and upper mantle structure for the island. The total vertical displacement of the Moho is about 6 km beneath a point near the summit of Mauna Loa. The unreversed Pn velocity is 7.9 km/sec beneath the Kau-Puna coast and 8.2 km/sec beneath the Kona coast. Analysis of the profiles suggests that the volcanic rift zones of Mauna Loa and Kilauea are cored with high velocity, high density rocks (Vp about 6.9 km/sec, density about 2.9 g/cc), which reach to

within a few kilometers of the surface of the island. The rift zones widen with depth and coalesce such that a large part of the volanic pile is composed of high velocity and high density rift zone rock. Dissert. Abstr.

N82-13584 Stanford Univ., Calif.
SURFACE WAVES IN STRONG GROUND MOTION WITH APPLICATION TO OFFSHORE ENVIRONMENTS Ph.D. Thesis
Henry Jay Swanger 1981 155 p
Avail: Univ. Microfilms Order No. 8124164

Synthetic seismogram techniques are used to determine the characteristics of one to ten second period strong ground motion due to seismic surface waves. Of particlar interest is the response of offshore geologies, for which little or no strong ground motion data exist. Theoretical responses were computed for a continental shelf-like crustal model and an onshore crustal model and compared. The synthetic offshore motions have larger peak velocities, longer durations and larger spectral response. Over much of the period range of interest, the large response is independent of the site soil characteristics and due to the velocity gradients of the rock structure. This suggests that the use of average onshore response characteristics adjusted only for local soil conditions may not be adequate for specifying design characteristics offshore. Site specific studies accounting for both the local rock and soil properties are probably necessary.
Dissert. Abstr.

N82-13585 Polytechnic Inst. of New York, Brooklyn.
IONOSPHERIC SCINTILLATION Ph.D. Thesis
David Ming-Whei Wu 1981 223 p
Avail: Univ. Microfilms Order No. 8118903

A renomalization technique, employed in the spirit of the formal theory of scattering, is applied to the problem of ionospheric scintillation. The forward scattering approximation for wave propagation and a Markov approximation for ionospheric fluctuations are used to derive renomalized moment equations descriptive of the wave statistics. The scintillaton index for the case of a plane wave propagating thru the ionosphere is studied for the case of an arbitrary power spectrum of ionospheric fluctuations. An experimental power spectrum, corresponding to relative density fluctuations of about 20% as obtained from in situ measurements by the Atmospheric Explorer-E satellite, is used to calculate the corresponding index for night time equatorial scintillations. For an ionospheric slab model with a thickness of 200 Km and an altitude of 300 Km numerical calculations yield an almost saturated scintillation index of about 1.1.
Dissert. Abstr.

N82-13586 Delaware Univ., Newark.
TURBULENT TRANSFERS IN THE ATMOSPHERIC SURFACE LAYER UNDER VARIED STABILITY CONDITIONS. A LABORATORY STUDY Ph.D. Thesis
Yuan-Huang Lawrence Hsu 1981 176 p
Avail: Univ. Microfilms Order No. 8123798

Rates of momentum, heat, and mass transfers across the air-water interface under different stability conditions are measured in a wind wave tank. A complete instrumentation system is developed to measure mean and fluctuating quantities of wind velocity and air temperature, mean air humidity, and surface waves. A data processing system, including amplifiers, low and high bass filters and multipliers, is also developed. The mean quantities are processed in real time on a computer, which is also used to digitize and to process the turbulence data stored on magnetic tapes. Dissert. Abstr.

N82-13587 Northwestern Univ., Evanston, Ill.
PLASTIC FLOW AND UNSTABLE DEFORMATION OF GEOLOGICAL MATERIALS Ph.D. Thesis
James Frank Dorris 1981 125 p
Avail: Univ. Microfilms Order No. 8124875

A plasticity theory to describe the flow of granular materials was developed. The theory accounts for true stress triaxiality, pressure sensitivity, and dilatancy. The unstable deformation of a layer on a half space under the action of compressive forces parallel to the free surface are considered. The material properties considered for the layer and the half space are various combinations of elasticity an plasticity. Both the flow and the total deformation plasticity models are used. It is concluded that results are relevant to the folding of geological formations and crustal buckling under tectonic stresses. Dissert. Abstr.

N82-13588 Stanford Univ., Calif.
THEORY AND APPLICATION OF EXPERIMENTAL MODEL ANALYSIS IN EARTHQUAKE ENGINEERING Ph.D. Thesis
Piotr Daniel Moncarz 1981 279 p
Avail: Univ. Microfilms Order No. 8124110

The feasibility and limitations of small-scale model studies in earthquake engineering research and practice is considered with emphasis on dynamic modeling theory, a study of the mechanical properties of model materials, the development of suitable model construction techniques and an evaluation of the accuracy of prototype response prediction through model case studies on components and simple steel and reinforced concrete structures. It is demonstrated that model analysis can be used in many cases to obtain quantitative information on the seismic behavior of complex structures which cannot be analyzed confidently by conventional techniques. Methodologies for model testing and response evaluation are developed in the project and applications of model analysis in seismic response studies on various types of civil engineering structures (buildings, bridges, dams, etc.) are evaluated. Dissert. Abstr.

N82-13589 Institut d'Aeronomie Spatiale de Belgique, Brussels.
THE INTERNAL STRUCTURE OF THE MAGNETOPAUSE Ph.D. Thesis - Univ. Libre de Brussels [LA STRUCTURE INTERNE DE LA MAGNETOPAUSE]
M. Roth 1980 345 p refs In FRENCH; ENGLISH summary (Aeronomica-Acta-A-221-1980) Avail: Issuing Activity

A kinetic model which describes the internal structure of the magnetopause is developed. Among other factors, the model takes into account the interplanetary magnetic field and the thermal motion of the particles. The structure of a tangential discontinuity in a multicomponent collisionless plasma is described. From consideration of the two-stream instabilities, a minimum magnetopause thickness is deduced. In a hydrogen plasma, this structure corresponds to an ionic layer in which the electric current is only the result of a displacement of ions. The tangential discontinuities observed at the magnetopause are likened to regions where magnetosheath and magnetospheric plasmas are interpenetrated. Quantitative results show that the variations of the different physical factors are analogous to those of satellite observations. More generally, the parameters characterizing this model make it appropriate to describe many types of tangential discontinuities which are likely to appear in other cosmic collisionless plasmas. Author (ESA)

N82-13590# Finnish Meteorological Inst., Helsinki.
MAGNETIC RESULTS FROM NURMIJAERVI GEOPHYSICAL OBSERVATORY 1980, NO. 22
1981 34 p
(ISBN-951-697-155-5; ISSN-0071-5212) Avail: NTIS HC A03/MF A01

Magnetic disturbance measurements are presented in tabular form. Variometers and proton magnetometers are used. S.L.

N82-13591# Finnish Meteorological Inst., Helsinki.
THREE-DIMENSIONAL MAPPING OF THE AURORA FROM DIGITIZED ALL-SKY PICTURES
Kari U. Kaila Apr. 1981 42 p refs
(Rept-550.388.8; TR-25; ISBN-95-697-148-22; ISSN-0355-1733) Avail: NTIS HC A03/MF A01

A mathematical method of calculating the altitudes and geographical positions of discrete auroral forms is presented. It is based on pairs of simultaneous all-sky frames taken at two stations and requires knowledge of the positions, orientation errors and scale functions of the all-sky cameras. The corresponding points of the aurora need not be known. After the corrections, any point in the sky can be determined with an accuracy of about 0.2 deg. The accuracy that can be reached is of the order of 1 km in altitude and 2 km in position. Author

N82-13592*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SAM 2 MEASUREMENTS OF THE POLAR STRATOSPHERIC AEROSOL, VOLUME 1: OCTOBER TO APRIL 1979

M. Patrick McCormick Dec. 1981 78 p refs
(NASA-RP-1081) Avail: NTIS HC A05/MF A01 CSCL 04A

Weekly averages of Antarctic and Arctic stratospheric aerosol data as well as corresponding temperature profiles for the time and place of each stratospheric aerosol measurement (SAM) II measurement during the first 6 months of satellite flight are presented. From the aerosol extinction profile data, contours of aerosol extinction as a function of altitude and longitude or time are plotted. Aerosol optical depths are calculated for each week. Polar stratospheric clouds at altitudes of about 22 km were observed during the Arctic winter at various times and locations. A representative sample of the first 6 months of data to be used in atmospheric and climatic studies is outlined.
E.A.K.

N82-13593*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC CLOUDS BETWEEN 2-4 AU: VOYAGER OBSERVATIONS
L. F. Burlaga and Kenneth W. Behannon Oct. 1981 26 p refs Submitted for publication
(NASA-TM-83849) Avail: NTIS HC A03/MF A01 CSCL 04A

Magnetic clouds were observed in the solar wind between 2-4 AU. It was shown that they are stable enough to persist without major changes out to such distances. It is estimated that the clouds expand at a speed of the order of 45 km/s. The average Alfven speed at the front and rear boundaries is 104 km/s, the expansion speed is estimated to be nearly half of the Alfven speed, which is consistent with an earlier estimate of the expansion speed of clouds between the Sun and 1 AU. The magnetic field configuration is highly ordered and consistent with the passage of some kind of loop.
E.A.K.

N82-13594*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LARGE-SCALE VARIATIONS OF THE INTERPLANETARY MAGNETIC FIELD: VOYAGER 1 AND 2 OBSERVATIONS BETWEEN 1-5 AU
L. F. Burlaga, R. P. Lepping, K. W. Behannon, L. W. Klein (Computer Sciences Corp., Silver Spring, Md.), and F. M. Neubauer (Technische Univ., Brunswick) Oct. 1981 36 p refs Submitted for publication
(NASA-TM-83850) Avail: NTIS HC A03/MF A01 CSCL 04A

Observations by the Voyager 1 and 2 spacecraft of the interplanetary magnetic field between 1 and 5 AU were used to investigate the large scale structure of the IMF in a period of increasing solar activity. The Voyager spacecraft found notable deviations from the Parker axial model. These deviations are attributed both to temporal variations associated with increasing solar activity, and to the effects of fluctuations of the field in the radial direction. The amplitude of the latter fluctuations were found to be large relative to the magnitude of the radial field component itself beyond approximately 3 AU. Both Voyager 1 and Voyager 2 observed decreases with increasing heliocentric distance in the amplitude of transverse fluctuations in the averaged field strength (B) which are consistent with the presence of predominantly undamped Alfven waves in the solar wind, although and necessarily implying the presence of them. Fluctuations in the strength of B (relative to mean field strength) were found to be small in amplitude, with a RMS which is approximately one third of that for the transverse fluctuations and they are essentially independent of distance from the Sun.
M.G.

N82-13595*# Lunar and Planetary Inst., Houston, Tex.
PAPERS PRESENTED TO THE CONFERENCE ON THE PROCESSES OF PLANETARY RIFTING
1981 218 p refs Conf. held in Napa Valley, Calif., 3-5 Dec. 1981; sponsored by NASA, and NSF and American Geophysical Union
(LPI-CONTRIB-457; NASA-CR-165034) Avail: NTIS HC A10/MF A01 CSCL 08G

The basic problems of processes of planetary rifting are addresed from the following viewpoints: (1) speculation as to the origin and development of rifts; (2) rifts on other planets; (3) tectonics; (4) geology; (5) chemistry of the lithosphere; (6) physics of the lithosphere; and (7) resources associated with rifting. The state of ignorance on the subject and its remedy is debated.
A.R.H.

N82-13596*# Pennsylvania Univ., Philadelphia. Dept. of Geology and Planetary Science.
BASEMENT ROCKS OF THE MAIN INTERIOR BASINS OF THE MIDCONTINENT
Edward G. Lidiak [1981] 43 p refs
(Grant NsG-5270)
(NASA-CR-164935) HC A03/MF A01 CSCL 08G

The Precambrian framework of the Michigan, Illinois, Williston, Salina-Forest City, and Arkoma basins are discussed. The basins were categorized according to types that occur in the midcontinent and adjacent areas. Intracratonic basins were contrasted to foreland basins and aulacogens. The possible origins of intracratonic basins of the midcontinent are discussed.
R.J.F.

N82-13597# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Ice Engineering Research Branch.
METHOD FOR MEASURING BRASH ICE THICKNESS WITH IMPULSE RADAR
Carl R. Martinson and Arnold M. Dean, Jr. Jun. 1981 14 p refs
(Contract Z51100-00003)
(AD-A103738; CRREL-SR-81-11) Avail: NTIS HC A02/MF A01 CSCL 08/12

A subsurface impulse radar system on board a cutter was used to measure brash ice thickness in the Great Lakes. Manual ice thickness measurements were made in the test area to calibrate the radar data and to determine radar range settings. Radar collected data were recorded on magnetic tape and later played back to a graphic recorder for interpretation.
Author

N82-13598# Sierra Geophysics, Inc., Arcadia, Calif.
TIME DOMAIN WAVEFORM INVERSION OF SHORT-PERIOD P-WAVES FOR NUCLEAR EXPLOSION SOURCE TIME FUNCTIONS Final Report
Larry J. Ruff 9 Jan. 1981 46 p refs
(Contract F49620-79-C-0012)
(AD-A101123; SGI-R-80-034) Avail: NTIS HC A03/MF A01 CSCL 18/3

The source time parameters of underground nuclear explosions from the waveforms of short period teleseismic P-waves was estimated. Three source parameters, two that describe the source time function and one for the delay time of the (P)p are discussed. The effect on the waveforms of a decreased (P)p amplitude are considered. Another parameter which has a significant influence upon the observed waveforms is t (t = travel time/ Q(av)). The variation in the source parameter estimates due to a varying t are addressed.
Author

N82-13599# Hawaii Inst. of Geophysics, Honolulu.
PROGRESS IN THE GLOBAL STANDARIZATION OF GRAVITY: AN ANALYSIS OF THE WOOLLARD AND ROSE INTERNATIONAL GRAVITY VALUES
George P. Woollard and Valerie M. Godley Dec. 1980 156 p refs
(Contract N00014-75-C-0209; Grant NSF EAR-77-28552; NR Proj. 083-603)
(AD-A099459; HIG-80-2) Avail: NTIS HC A08/MF A01 CSCL 08/14

Standardization since the advent of high range gravimeters in 1948 was reviewed. The gravity base values given in 'International Gravity Measurements' are evaluated against the most recent set of standardized gravity base values. Adjunct IGSN 71 values are also used to give a more comprehensive worldwide comparison of values. The results for 787 comparisons of Woollard and Rose values and IGSN 71 values for the same sites indicate that, in general, there is no difference in gravity standard represented.
T.M.

N82-13600# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
MEASUREMENTS OF HEAVY IONS IN THE LOW ALTITUDE REGIONS OF THE OUTER ZONE Interim Report
J. B. Blake, J. F. Fennell, and D. Hovestadt (Max-Planck-Inst. fuer Physik und Astrophysik, Garching, West Germany) 15 Apr.

1981 35 p refs
(Contract F04701-80-C-0081)
(AD-A099453; TR-0081(6960-05)-8; SD-TR-81-25) Avail: NTIS HC A03/MF A01 CSCL 04/1

Measurements of heavy ions in the low altitude outer zone are discussed. Data were acquired with a heavy ion sensor aboard the S3-2 satellite. Equatorial measurements gave a large He/CNO ratio; clearly magnetospheric processes strongly discriminate against populating the low altitude regions with ions of increasing mass in the energy range of hundreds of keV. It is indicated that the low altitude CNO/He ratio is strongly time dependent.
Author

N82-13601# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
TWO-SATELLITE STUDY OF PROTON DRIFT ON QUIET DAYS
A. Korth, G. Kremser, and K. F. Fennell 30 Jul. 1981 15 p refs Prepared in cooperation with Max-Planck-Institut fuer Aeronomie, Datlenburg-Lindau
(Contract F04701-80-C-0081)
(AD-A104736; TR-0081(6960-05)-2; SD-TR-81-59) Avail: NTIS HC A02/MF A01 CSCL 04/1

The drift shells of protons in a model magnetic field were calculated. The radial gradient of the protons is combined with calculated drift shells to predict the flux levels at several local times for different pitch angles and energies. The field model is a three term Mead model, which is fit to the observed B-values at synchronous orbit. The predicted local time dependent fluxes match the observed fluxes, and correctly predict the pitch angle dependencies.
Author

N82-13602# Naval Research Lab., Washington, D. C. Atmospheric Physics Branch.
ATMOSPHERIC 222RN MEASUREMENTS AT SAN NICOLAS ISLAND DURING 1980 Interim Report
R. E. Larson and R. K. Jeck 13 Oct. 1981 10 p refs
(AD-A104802; NRL-MR-4649) Avail: NTIS HC A02/MF A01 CSCL 04/1

Radon concentration in the near surface air at San Nicolas Island, California, was measured. Unreported results for January and July 1980 are emphasized. For six of eight days during the January session the measured radon concentration was greater than 40 picocuries/cubic m corresponding to a continential air mass. Only the first day involved a maritime air mass with radon concentration less than about 6 picocuries/cubic m. In contrast to all the previous sessions, maritimes, air dominated the ten day session in July 1980, with radon concentrations generally less than about 5 picocuries/cubic m.
Author

N82-13603# Norwegian Defence Research Establishment, Kjeller.
HIGH LATITUDE MEASUREMENTS OF THE TOTAL ELECTRON CONTENT (TEC) USING THE FARADAY TECHNIQUE AND COMPARISONS WITH TEC ESTIMATES FROM NAVSTAR-GPS DATA Final Technical Report, Apr. 1980 - Apr. 1981
Kaare Aksnes Jun. 1981 6 p refs
(Contract DAJA37-80-C-0193)
(AD-A103042) Avail: NTIS HC A02/MF A01 CSCL 04/1

A VHF electronic polarimeter for total electron content (TEC) measurements is in operation at Tromso Telemetry Station in Norway. The polarimeter is receiving data from the geostationary satellite SIRIO, which is situated almost due south of Tromso at 8 deg elevation. Except for loss of data during periods when the satellite was eclipsed by the Earth's shadow, continuous data coverage is maintained. Preliminary analysis of the obtained TEC data and similar data deduced from NAVSTAR-GPS measurements reveal agreement.
GRA

N82-13604# Research Inst. of National Defence, Stockholm (Sweden).
INTERNATIONAL SEISMOLOGICAL DATA CENTER. INPUT DATA FOR AN EXPERIMENTAL DATA BASE
Gunnel Barkeby Nov. 1980 289 p refs
(FOA-C-20380-T1) Avail: NTIS HC A13/MF A01

Temporary international seismological data center facilities were set up at Hagfors Laboratory, (1) to demonstrate one way of carrying out the main tasks of a global monitoring system which would be necessary to verify an international test ban treaty and (2) to facilitate experimental studies into the technical and scientific details of the functions which would be performed by such a center. The facilities include the compilation of an experimental data base. The input part of data base is listed together with information on the use of the observations in automatic analysis, either defining, or being associated with, events. The available parameters are divided into those obtained from short period and from long period instruments.
Author (ESA)

N82-13605# Bonn Univ. (West Germany). Inst. fuer Astrophysik und Extraterrestische Forschung.
TEMPERATURE AND DENSITY OF GEOCORONAL HELIUM DERIVED FROM A ROCKET-BORNE He RESONANCE CELL EXPERIMENT Final Report
Peter B. Seidl Bundesministerium fuer Forschung und Technologie Dec. 1980 99 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-80-015; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20,80

The helium resonance radiation intensity of 58.4 nm was observed with a helium resonance cell photometer aboard a Black Brant 4b rocket during a daytime flight up to a height of 720 km. The height dependence of the optically thin part of resonance emission permits the deduction of the geocoronal helium temperature and density. A procedure is explained which allows the optically thin from the optically thick contribution to be distinguished and analyzes them separately. At 700 km the temperature found attains 1130 K and the density 1.35 X 10 to the 5/cucm. Whereas the temperature obtained is in reasonable agreement with current model values, the density is considerably lower than theoretically predicted.
Author (ESA)

N82-13606# National Geodetic Survey, Rockville, Md.
REPORT OF SURVEY FOR MCDONALD OBSERVATORY, HARVARD RADIO ASTRONOMY STATION, AND VICINITY
William E. Carter and James E. Pettey May 1981 91 p refs
(PB81-234338; NOAA-TM-NOS-NGS-32; NOAA-81062603) Avail: NTIS HC A05/MF A01 CSCL 08E

A special purpose three dimensional geodetic survey was conducted near Ft. Davis, Texas. The observing program included astronomic positions and azimuths, zenith distances, electromagnetic distance measurements, leveling, gravity measurements, Doppler satellite positioning, and a variety of ancillary measurements. Information on the methods employed in the collection, reduction, and analysis of the survey data, tabulations of the observational data, and numerical and interpretive results is reported.
GRA

N82-13607# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF: ANNUAL REPORTS OF PRINCIPAL INVESTIGATORS FOR THE YEAR ENDING MARCH 1980. VOLUME 5: HAZARDS Annual Report
Feb. 1981 665 p refs Sponsored in part by the Bureau of Land Management
(PB81-225732; NOAA-81052107) Avail: NTIS HC A99/MF A01 CSCL 08G

Hazards caused by the environmental conditions are reported. Environmental pollution resulting from the development of oil and gas resources in Alaskan waters was investigated.
T.M.

N82-13608 Northwestern Univ., Evanston, Ill.
THE EFFECTS OF ATMOSPHERIC TURBULENCE ON THE ATMOSPHERIC TRANSMITTANCE AT OPTICAL FREQUENCIES Ph.D. Thesis
Chii-Feng Ouyang 1981 162 p
Avail: Univ. Microfilms Order No. 8124972

A detailed treatment of optical wave propagation in the atmosphere using the extended Huygens-Fresnel principle and the theory of atmospheric turbulence is presented. The average intensity and deviation of intensity for ocean waves due to the

turbulence effect was calculated. Spatially partially coherent sources were used. The effects of a finite aperture receiver are included. Starting with the time independent stochastic wave equation (the slow time dependence of the field fluctuations is suppressed by using Taylor's frozen in hypothesis), the second moment and fourth moment nutual coherence equation were derived using the Kolmogorov spectrum of turbulence. Intensity distribution and scintillation index was then found.Dissert. Abstr.

N82-13609 California Univ., Riverside.
COLLOIDAL PROPERTIES OF COAGULATED CALCIUM-MONTMORILLONITE SUSPENSIONS Ph.D. Thesis
Nancy Beatrice Ball 1981 145 p
Avail: Univ. Microfilms Order No. 8122834

Changes in clay particle shape, size and structure were studied as the concentration of calcium electrolyte in clay suspensions increased to 1 M and as the complexing capability of the anion increased. The viscosity turbidity and sedimentation rate of Ca montmorillonite suspensions containing CaCl2, (NO3)2 or Ca(ClO4)2 were measured. Chloride and nitrate anions were assumed to form the species, CaCl(+) and CaNO3(+) whereas the perchlorate anion was assumed to form calcium complex. The viscosities of the suspensions, measured using a capillary viscometer, were regressed on both clay and salt concentrations. The limiting viscosity number, or intrinsic viscosity, calculated from the regression equations is shown to be related to the axial ratio of the clay particles and the amount of occluded solution within the particles. Dissert. Abstr.

N82-13610 California Univ., Santa Cruz.
PETROLOGY AND GEOCHEMISTRY OF OPHIOLITE FRAGMENTS IN A TECTONIC MELANGE, KODIAK ISLANDS, ALASKA Ph.D. Thesis
Betsy Jo Beyer 1980 231 p
Avail: Univ. Microfilms Order No. 8123245

The results of a study of five small ultramafic and bodies in the Kodiak Islands, part of a belt of such rocks tectonically included within the Crestaceous Uyak Complex and correlative rocks of southern Alaska are presented. A pivotal aspect of this project was to determine whether these isolated fragments of a presumed ophiolite sequence might be shown to be related to each other in the absence of such definitive field evidence as is commonly found in continuous ophiolite sequences. Based on the strong similarities of their constituent rock types, the blocks of the Kodiak dismembered ophiolite were probably formed in the same or similar environments. Four of the five bodies contain nearly identical layered clinopyroxenites and dunites; two of these bodies also contain identical layered gabbronorites. Ferrogabbro, quartz gabbro, tonalite, and basaltic dikes are the major constituents of only one ophiolite fragment, but minor feldspathic wehrites occur in both this fragment and one other.
Dissert. Abstr.

N82-13611 Northwestern Univ., Evanston, Ill.
THE NITROGEN CYCLE AND HEAT BUDGET OF A SUBTROPICAL LAGOON, DEVILS HOLE, HARRINGTON SOUND, BERMUDA: IMPLICATIONS FOR NITROUS OXIDE PRODUCTION AND CONSUMPTION IN MARINE ENVIRONMENTS Ph.D. Thesis
Irving Foster Brown 1981 338 p
Avail: Univ. Microfilms Order No. 8124858

From May to September, 1978, the vertical and temporal patterns of ammonium, nitrite, nitrate, nitrous oxide, and oxygen concentrations were investigation during development of thermal stratification in the subtropical oligotrophic lagoon of oceanic salinity. Devil's Hole (32.33 deg N,64.70W). The objective of the study was to resolve the time-dependent response of processes governing the inorganic components of the marine nitrogen cycle to thermocline development and declining oxygen concentrations in a subthermocline region. During this period differential absorption of solar irradiance with depth together with wind-induced vertical mixing resulted in the partitioning of the water column into three regions: surface mixed layer (0m. 12 m depth), thermocline region (12 m - 20m), and subthermocline region (29 m- 24.5m). Dissert. Abstr.

N82-13612 Ohio State Univ., Columbus.
SIMULATION STUDIES ON THE COMPUTATION OF THE GRAVITY VECTOR IN SPACE FROM SURFACE DATA CONSIDERING THE TOPOGRAPHY OF THE EARTH Ph.D. Thesis
Kostas Evangelos Katsambalos 1981 146 p
Avail: Univ. Microfilms Order No. 8121810

Three approaches for the computation of the components of the gravity vector in space considering the topography of the Earth were investigated: (1) a numerical integration based on the appliction of Green's third identity; (2) the discrete dirac; and (3) the least-squares collocation. Under a spherical approximation, the surface of the Earth is assumed to be known through the elevations of its points above a reference sphere. The first technique requires as data gravity disturbances and disturbing potentials on the Earth's surface, while the other two techniques require as data surface gravity anomalies. The agreement between the rigorously computed vectors and those from the three techniques, is analyzed. It is indicated that in comparing the techniques with the classical approach (the Direct Integration Method), the consideration of the topography improves signficantly the accuracy of the computations. Dissert. Abstr.

N82-13613 Missouri Univ. -Rolla.
AN INVESTIGATION OF THE NICKEL-COBALT OCCURRENCE IN THE SOUTHEAST MISSOURI MINING DISTRICT Ph.D. Thesis
David Ray Jessey 1981 230 p
Avail: Univ. Microfilms Order No. 8123585

A study of the occurrence of nickel and cobalt in the Southeast Missouri Mining District revealed several significant geochemical trends and mineralogical relationships. Regional geochemical studies indicate that the greatest concentration of nickel and cobalt occurs in the Fredericktown area. Mines in the Viburnum Trend also have significant concentrations of these metals. Studies of the Viburnum Trend have established that both nickel and cobalt decrease in concentration southward from the Magmont mine to the Brushy Creek mine, increase at the Fletcher mine, and decrease again at the Sweetwater mine. A detailed geochemical study of the Buick mine shows that this same decrease southward is more pronounced at the mine level and that copper trends very closely mimic those of nickel and cobalt. The north-south zoning is also substantiated by an observed decrease in silicification from north to south within the Magmont and Buick mines. Studies of the individual ore bodies reveal differences in metal zoning which indicate that they may not be contemporaneous. Nickel/cobalt ratios also show significant patterns. Dissert. Abstr.

N82-13614# South Carolina Univ., Columbia.
STRUCTURAL AND STRATIGRAPHIC ANALYSIS OF THE PALEOZOIC MURZUK AND GHADAMES BASINS, WESTERN LIBYA Ph.D. Thesis
Richard Mark Karasek 1981 164 p
Avail: Univ. Microfilms Order No. 8123422

The intracratonic basins in western Libya are characterized by extensional basement controlled faulting along northwest and northeast trends. The northwest southeast trending Tripoli-Soda, Ben Ghenma and Hasi Atshan subsurface arches were uplifted from Cambian through Devonian time. The anomalous west-southwest trending Gargaf Arch acted as a hinge line from Silurian through Devonian time, with consequent paleoslopes to the northwest (Ghadames Basin) and southeast (Murzuk Basin). Paleozoic detrital sediments are up to 1500 m thick in the Murzuk Basin and 2500 m thick in the Ghadames Basin. Five depositional sequences comprise transgressive-regressive cycles of deposition from parallic (coarse grained) to marine (fine-grained). Detailed environmental interpretation of the sequences is based on outcrop models for the Middle Devonian-Lower Carboniferous Aouinet Ouenine and Shatti Formations. Dissert. Abstr.

N82-13615 Emory Univ., Atlanta, Ga.
RATES AND MECHANISMS OF CHEMICAL WEATHERING IN AN ORGANIC ENVIRONMENT AT PANOLO MOUNTAIN, GEORGIA Ph.D. Thesis
Roy Arthur Nixon, III 1981 182 p
Avail: Univ. Microfilms Order No. 8110018

Chemical weathering consists of alteration of micas and feldspars to halloysite through intermediate gibbsite and allophane. Gibbsite is the first mineral produced from chemical weathering.

Allophane results from the reaction of gibbsite with dissolved silica. Analyses of more than 600 published water analyses were used to calculate a free energy of formation for allophane of -896.79 kcal/mole based on the kaolin formula and disregarding the effects of structural water. A trend surface plot of the data using least squares gave a surface which represents equilibrium, and has a minimum solubility of aluminum at pH 6.7. The Gibbs free energy of formation for the ion Al(OH)2(+) is calculated to be -216.8 kcal/mole. Dissert. Abstr.

N82-13616 Stanford Univ., Calif.
STUDIES OF NATURAL FRACTURES, FAULT ZONE PERMEABILITY, AND A PORE SPACE-PERMEABILITY MODEL Ph.D. Thesis
Donald Alan Seeburger 1981 243 p
Avail: Univ. Microfilms Order No. 8124147

The natural fracture distribution encountered in boreholes is presented. The distribution an orientation of fractures in these wells were determined using an ultrasonic borehole televiewer. The number of fractures observed was relatively independent of depth. The characteristics of fluid flow around fault zones are described. Faults are often described as conduits or barriers to fluid flow. In cases for which faults appear to act as both barriers and conduits, the required permeability is highly anisotropic. A network model of pore space from which permeability and bulk modulus can be calculated as a function of confining pressure is presented. Pores are modeled as straight conduits of circular, elliptic, or tapered section. Flow through each conduit is modeled using Poiseuille flow. Dissert. Abstr.

N82-13617 Stanford Univ., Calif.
TWO DETAILED SEISMIC STUDIES IN CENTRAL CALIFORNIA. PART 1: EARTHQUAKE CLUSTERING AND CRUSTAL STRUCTURE STUDIES OF THE SAN ANDREA FAULT NEAR SAN JUAN BAUTISTA. PART 2: SEISMIC VELOCITY STRUCTURE ALONG THE SIERRA FOOTHILLS NEAR OROVILLE, CALIFORNIA Ph.D. Thesis
Mary Ann Spieth 1981 174 p
Avail: Univ. Microfilms Order No. 8124157

A study was made of the spatial and temporal patterns of seismicity and the mechanics of faulting during a two-and-one-half year period along a 15 km segment of the San Andreas fault. Analysis of waveforms filtered from 0.5-5.0 Hz and precise relative locations from phase arrival times show that there are discrete patches on the fault which rupture repeatedly. First-motion focal mechanisms display a consistent pattern of right-lateral strike-slip motion. Analysis of traveltimes from a reversed active seismic refraction experiment in the western foothills of the Sierra Nevada reveals a localized layer of high velocity material within 10 km of the surface. This layer, a remnant of buried oceanic crust, has a five-fold increse in dip approximately 25 km south of the epicenter of the 1 August 1975 magnitude 5.7 earthquake near Oroville, California. Dissert. Abstr.

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N82-13618 North Carolina State Univ. at Raleigh.
AN EXPERIMENTAL STUDY OF TURBULENCE IN AN URBAN ENVIRONMENT Ph.D. Thesis
John Francis Clarke 1981 163 p
Avail: Univ. Microfilms Order No. 8121716

The structure of turbulence in the urban surface boundary layer is discussed. Wind and temperature fluctuations were measured with fast response sensors at a height of 31 m in four areas of varied land use in the St. Louis environs (a rural and three urban sites). The second moments of the fluctuations were computed for one hour time series and analyzed within the framework of Monin-Obukhov similarity theory (i.e., normalized by appropriate velocity and temperature scales). The results are discussed relative to observed land use features and calculated surface roughness lengths for each of the sites. Dissert. Abstr.

N82-13619 Northwestern Univ., Evanston, Ill.
APPLICATION OF BAYESIAN ANALYSIS FOR WIND ENERGY SITE EVALUATION Ph.D. Thesis
Harish Govinda Rao 1981 142 p
Avail: Univ. Microfilms Order No. 8124987

Extensive research had indicated that the wind speed is well modelled by the single-parameter Rayleigh distribution. The site mean wind speed is given a prior distribution obtained from historical National Weather Service data of sites in the region. The prior distribution is updated to a posterior each time observed data become available. The posterior distribution is combined with the Rayleigh distribution to obtain the Bayesian distribution of wind speed. This distribution can be used in conjunction with the turbine power characteristics of different machines to make rational decisions, based on the expected maximum utility criterion, for selecting the best turbine for a given site or the best site for a given turbine. Dissert. Abstr.

N82-13620*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPARISON OF DATA INVERSION TECHNIQUES FOR REMOTELY SENSED WIDE-ANGLE OBSERVATIONS OF EARTH EMITTED RADIATION
Richard N. Green Dec. 1981 46 p refs
(NASA-TP-1924; L-14591) Avail: NTIS HC A03/MF A01 CSCL 04B

The shape factor, parameter estimation, and deconvolution data analysis techniques were applied to the same set of Earth emitted radiation measurements to determine the effects of different techniques on the estimated radiation field. All three techniques are defined and their assumptions, advantages, and disadvantages are discussed. Their results are compared globally, zonally, regionally, and on a spatial spectrum basis. The standard deviations of the regional differences in the derived radiant exitance varied from 7.4 W-m/2 to 13.5 W-m/2. A.R.H.

N82-13621*# FWG Associates, Inc., Tullahoma, Tenn.
FEASIBILITY STUDY OF A PROCEDURE TO DETECT AND WARN OF LOW LEVEL WIND SHEAR Final Report
Barry S. Turkel, Philip A. Kessel, and Walter Frost Washington NASA Nov. 1981 82 p refs
(Contract NAS8-33458)
(NASA-CR-3480; M-365) Avail: NTIS HC A05/MF A01 CSCL 04B

A Doppler radar system which provides an aircraft with advanced warning of longitudinal wind shear is described. This system uses a Doppler radar beamed along the glide slope linked with an on line microprocessor containing a two dimensional, three degree of freedom model of the motion of an aircraft including pilot/autopilot control. The Doppler measured longitudinal glide slope winds are entered into the aircraft motion model, and a simulated controlled aircraft trajectory is calculated. Several flight path deterioration parameters are calculated from the computed aircraft trajectory information. The aircraft trajectory program, pilot control models, and the flight path deterioration parameters are discussed. The performance of the computer model and a test pilot in a flight simulator through longitudinal and vertical wind fields characteristic of a thunderstorm wind field are compared. E.A.K.

N82-13622*# Systems Applications, Inc., San Rafael, Calif.
DEVELOPMENT OF AN INFRARED RADIATIVE HEATING MODEL Final Report
Robert W. Bergstrom and Leland C. Helmle Apr. 1979 53 p refs
(Contract NAS2-10019)
(NASA-CR-166272; SAI-EF79-56) Avail: NTIS HC A04/MF A01 CSCL 04B

Infrared radiative transfer solution algorithms used in global circulation models were assessed. Computation techniques applicable to the Ames circulation model are identified. Transmission properties of gaseous CO2, H2O, and O3 are gathered, and a computer program is developed, using the line parameter tape and Voight profile subroutine, which computes the transmission of CO2, H2O, and O3. A computer code designed to compute atmospheric cooling rates was developed. E.A.K.

N82-13623*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPENSATION FOR USE OF MONTHLY-AVERAGED WINDS IN NUMERICAL MODELING
Claire L. Parkinson Nov. 1981 95 p refs
(NASA-TM-83855) Avail: NTIS HC A05/MF A01 CSCL 04B

Ratios R of the monthly averaged wind speeds to the magnitudes of the monthly averaged wind vectors are presented over a 41 x 41 grid covering the southern Ocean and the Antarctic continent. The ratio is found to vary from 1 to over 1000, with an average value of 1.86. These ratios R are relevant for converting from sensible and latent heats calculated with mean monthly data to those calculated with 12 hourly data. The corresponding ratios alpha for wind stress, along with the angle deviations involved, are also presented over the same 41 x 41 grid. The values of alpha generally exceed those for R and average 2.66. Regions in zones of variable wind directions have larger R and alpha ratios, over the ice-covered portions of the southern Ocean averaging 2.74 and 4.35 for R and alpha respectively. Thus adjustments to compensate for the use of mean monthly wind velocities should be stronger for the use of mean monthly wind velocities should be stronger for wind stress than for turbulent heats and stronger over ice covered regions than over regions with more persistent wind directions, e.g., those in the belt of mid-latitude westerlies. S.L.

N82-13624# Air Force Geophysics Lab., Hanscom AFB, Mass.
FIELD TESTS OF A SURFACE ICE ACCRETION MEASUREMENT SYSTEM Final Scientific Report
Paul Tattelman 23 Dec. 1980 23 p
(AF Proj. 6670)
(AD-A100282; AFGL-TR-81-0007; AFSG-435) Avail: NTIS HC A02/MF A01 CSCL 04/2

Rosemount ice detectors were installed at four New England locations to collect information on their response to icing near the Earth's surface. Data included, for each icing event, the recorded output of the ice detectors, the mass, thickness and physica properties of the ice on a control cylinder, and meteorological conditions pertinent to the field tests. Results indicated that the detector is excellent for objectively estimating icing amounts on a cylinder for in cloud icing on mountaintops. A method for making standardized observations of the mass and thickness of ice cylinders with varying diameters is presented Author

N82-13625# Air Force Geophysics Lab., Hanscom AFB, Mass. Optical Physics Div.
DMSP WATER VAPOR RADIANCES: A PRELIMINARY EVALUATION Scientific Interim Report
Francis R. Valovcin 6 Oct. 1980 30 p refs
(AD-A099305; AFGL-TR-80-0313; AFGL-AFSG-432) Avail: NTIS HC A03/MF A01 CSCL 04/2

Second stage hydralics (SSH) were analyzed. Middle and/or high troposheric cloudiness is determined by spectra radiances measured by the various water vapor channels. Clear or cloudy conditions determined the slope of the spectral radiance of only three SSH Channels. Many of the cloud free radiance/radiosonde sets are cloud contaminated. E.A.K.

N82-13626# Air Weather Service, Scott AFB, Ill.
FORECASTING SKILL
Kenneth E. German Jan. 1981 51 p refs
(AD-A099778; AD-E850057) Avail: NTIS HC A04/MF A01 CSCL 04/2

The accuracy of centrally produced prognoses improved throughout the past 20 years; however, several studies show negligible improvement in weather forecasting. Available data in more than 100 journal articles were reviewed to independently evaluate weather forecasting improvement. Overall forecasting skill improved for most weather elements; however, improvement was not obtained by all. A 'review' of other factors (education, experience, interest, and procedures) that might be important in determining forecasting skill shows that basic education and experience were achieved (2-3 months), the main factor contributing to forecasting skill is forecaster motivation. The AWS emphasis on accurate weather forecasting apparently is effective, and should be continued. Author

N82-13627# Pacific Northwest Lab., Richland, Wash.
NUMERICAL WIND-SPEED SIMULATION MODEL
J. V. Ramsdell, G. F. Athey, and M. Y. Ballinger Sep. 1981 88 p refs
(Contract DE-AC06-76RL-01830)
(DE82-000956; PNL-3864) Avail: NTIS HC A05/MF A01

A stochastic model for simulating wind speed time series that can be used as an alternative to time series from representative locations is described. The model incorporates systematic seasonal variation of the mean wind, its standard deviation, and the correlation speeds. It also incorporates systematic diurnal variation of the mean speed and standard deviation. Model capabilities, are simulated and results of analysis of simulated and actual data are compared. DOE

N82-13628# National Severe Storms Lab., Norman, Okla.
SPRING PROGRAM SUMMARY, 1980
R. J. Doviak Apr. 1981 142 p refs
(PB81-234940; NOAA-TM-ERL-NSSL-91; NOAA-81052901) Avail: NTIS HC A07/MF A01 CSCL 04B

A program summary on severe storm data to inform data analysts is presented. Principal objectives of the 1980 observations are: (1) to emphasize coordination of storm electricity measurements; (2) to observe the prestorm environment with Doppler radars modified for this purpose; (3) to support data collection for FAA and NASA experiments on storm hazards to aircraft; and (4) to support the hail collection experiment. GRA

N82-13629# Water and Power Resources Service, Denver, Colo. Office of Atmospheric Resources Research.
PROJECT SKYWATER: FISCAL YEAR 1979 REPORT. ATMOSPHERIC RESOURCES RESEARCH PROGRAM Annual Progress Report
Mar. 1981 105 p refs
(PB81-234494) Avail: NTIS HC A06/MF A01 CSCL 04B

Project Skywater, the water and power resources service percipitation management program is summarized; the program's goals and scopes are outlined. Equipment developed in support of general atmospheric research is discussed. Project activities and summaries of individual contracts are reviewed. Contract summaries are included. Listings of contractor and in-house reports and papers published during the fiscal period and a glossary of pertinent terms are appended. GRA

N82-13630# Water and Power Resources Service, Denver, Colo.
THE SIERRA COOPERATIVE PILOT PROJECT: PRECIPITATION MANAGEMENT RESEARCH IN THE SIERRA NEVADA Status Report
Dec. 1980 69 p
(PB81-234452) Avail: NTIS HC A04/MF A01 CSCL 04B

Research, design, environmental, coordination, and public involvement activities of the Water and Power Resources Service SCPP (Sierra Cooperative Pilot Project) are reported. The SCPP is an investigation of the technical feasibility and social acceptability of winter cloud seeding in the Sierra Nevada to supplement the region's future water supply. The results of the 1979-80 winter field season and reviews research undertaken by the SCPP in previous seasons are explained. GRA

N82-13631# National Oceanic and Atmospheric Administration, Boulder, Colo.
GEOPHYSICAL MONITORING FOR CLIMATIC CHANGE, NUMBER 8: SUMMARY REPORT, 1979
Gary A. Herbert Dec. 1980 129 p refs
(PB81-233355; NOAA-81062615) Avail: NTIS HC A07/MF A01 CSCL 04B

Continuous measurement of CO2 and aerosol scattering at four wavelengths, using a nephelometer, began at the South Pole station. A filter collection system was installed at the Barrow station to make possible the determination of the mass of the carbonaceous aerosols. It is shown that graphic carbon makes up a significant part of the arctic haze, and because of its optical absorptivity, it may cause a significant contribution to the radiative energy budget. At the Mauna Loa Observatory a cooperative measurement program to obscure the chemical composition of aerosols was initiated. GRA

N82-13632# National Weather Service, Silver Spring, Md.
NATIONAL WEATHER SERVICE PUBLIC FORECAST VERIFICATION Summary Report, Apr. 1973 - Mar. 1978
Duane S. Cooley, Frederick S. Zbar, Dean F. Dubofsky, and A. Kristine Campbell Mar. 1981 143 p refs
(PB81-231714; NOAA-TM-NWS-FCST-25; NOAA-81062605) Avail: NTIS HC A07/MF A01 CSCL 04B

Forecasting methods of general interest and wide application are reported. Forecasts of temperature and precipitation improved during the 5 year period from 1973 to 1977. One notable exception occurred during 1977, when the percent correct for precipitation decreased to the 1975 level after rising sharply during 1976. GRA

N82-13633# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
HAWAII MESOSCALE ENERGY AND CLIMATE PROJECT (HAMEC). 3: ATMOSPHERIC AEROSOL AND CLOUD MICROPHYSICS MEASUREMENTS
F. Parungo, C. Nagamoto, R. Schnell, I. Nolt, E. Nickerson, and W. Caldwell Mar. 1981 81 p refs
(PB81-231482; NOAA-81052910-Pt-3) Avail: NTIS HC A05/MF A01 CSCL 04B

Atmospheric aerosols and cloud microphysics over Hawaii using modern airborne instrumentation are investigated. Measurements of aerosol concentration, particle composition; cloud condensation nucleus and ice nucleus concentration; cloud droplet size distribution and cloud water chemistry are presented. GRA

N82-13634# National Weather Service, Honolulu, Hawaii.
SOME MEAN CHARACTERISTICS OF CENTRAL NORTH PACIFIC TROPICAL CYCLONES
Hans E. Rosendal Jun. 1981 18 p ref
(PB81-230492; NOAA-81062606; NOAA-NWS-TM-PR-23) Avail: NTIS HC A02/MF A01 CSCL 04B

Ninety-nine tropical cyclone tracks traversing the Central Pacific Hurricane Center region during the period 1832-1979 were completed. Climatic data base with several mean characteristics of these cyclones were computed. Of the 99 listed cyclones, 81 occurred on the presatellite era before 1960. GRA

N82-13635# National Oceanic and Atmospheric Administration, Silver Spring, Md.
ATMOSPHERIC DISPERSION FORECASTS AT SELECTED LOCATIONS IN THE UNITED STATES
Roland R. Draxler Apr. 1981 17 p refs
(PB81-230443; NOAA-TM-ERL-ARL-100; NOAA-81062607) Avail: NTIS HC A02/MF A01 CSCL 04B

Forecasts of atmospheric dispersion up to 48 hours after observation times are calculated by combining the techniques of estimating dispersion with NOAA numerical weather forecasts of wind direction, wind speed, cloud cover, and ceiling. The variables used to estimate dispersion are part of the routine forecast from the Techniques Development Laboratory's Model Output Statistics. GRA

N82-13636# National Weather Service, Salt Lake City, Utah.
ANNUAL DATA AND VERIFICATION TABULATION, EASTERN NORTH PACIFIC TROPICAL STORMS AND HURRICANES 1980
Emil B. Gunther et al May 1981 18 p refs
(PB81-230336; NOAA-TM-NWS-WR-165; NOAA-81052903) Avail: NTIS HC A02/MF A01 CSCL 04B

Annual data on eastern North Pacific tropical cyclone activity are presented. Data are provided by the National Weather Service; the National Earth Satellite Service Field Station, San Francisco, California, and the Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH), Miami, Florida. A summary of 1980 eastern North Pacific tropical cyclone statistics is given in tabular form. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N82-13637*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BIOLOGICAL AND PHYSICAL OCEANOGRAPHIC OBSERVATIONS PERTAINING TO THE TRAWL FISHERY IN A REGION OF PERSISTENT COASTAL UPWELLING
John T. Howe, David B. Gibson (Seeadler Co., Morgan Hill, Calif.), Travis O. Evans (Trawler Bountiful, Port of Avila, Calif.), Larry Breaker (National Earth Satellite Service, Redwood City, Calif.), Robert C. Wrigley, and William W. Broenkow (Moss Landing Marine Labs., Moss Landing, Calif.) Nov. 1981 19 p refs
(NASA-TM-81332; A-8745) Avail: NTIS HC A02/MF A01 CSCL 08A

An upwelling episode in the Point Sal region of the central California coast is examined by using data obtained by a data buoy. The episodes was interrupted by the abrupt abatement of the strong wind which promotes coastal upwelling. The mean hourly upwelling index is calculated to be higher than the 20 year mean monthly value. During 3 days of light wind commercial bottom trawl operations were possible. Shipboard estimates of chlorophyll content in surface waters during trawling show the high concentrations that are indicative of a rich biomass of phytoplankton, a result of the upwelling episode. Satellite imagery shows the extent of the upwelling water to be of the order of 100 km offshore; the result of many upwelling episodes. Shipboard echo sounder data show the presence of various delmersal species and of zooplakton; the latter graze on the phytoplankton in the upper euphotic layers. The fish catch data are recorded according to species for 2 days of trawling, and the catch per trawl hour is recorded. S.L.

N82-13638# Texas Univ. at Arlington. Applied Research Labs.
ACOUSTICAL PROPERTIES OF SEDIMENTS Annual Report, 1 Jan. - 31 Dec. 1980
Donald J. Shirley 11 May 1981 159 p refs
(Contract N00014-76-C-0117)
(AD-A103726; ARL-TR-81-20) Avail: NTIS HC A08/MF A01 CSCL 08/10

The in situ acoustic measuring system was configured to enable concurrent measurement of compressional wave velocity and attenuation, shear wave velocity and attenuation acoustic impedance, static shear strength, and corer acceleration. The recording instrument and transducers were successfully tested in the laboratory and were prepared for field testing. A laboratory experiment was concluded to test predictions of the analytical model. Viscosity of the pore fluid in an artificial sediment of spherical glass beads was varied by mixing various concentrations of glycerin with water. Results of the experiment indicate that predictions of the model do not match measured data. The updated electronic circuits and the software required for the microprocessor playback unit are provided. Author

N82-13639# SACLANT ASW Research Center, La Spezia (Italy).
THE SACLANTCEN OCEANOGRAPHIC DATA BASE. VOLUME 1: DESIGN CRITERIA AND DATA STRUCTURE AND CONTENT
Richard F. J. Winterburn 15 Jun. 1981 30 p refs
(AD-A103277; SACLANTCEN-SM-150-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 08/10

An oceanographic data base established at SACLANTCEN on a UNIVAC 1106 computer system is described. The design criteria used in setting up the data base, its structure and content, how data, were acquired either from outside institutions or from SACLANTCEN experiments are reformatted and entered are discussed. Data are accessed, interrogated, and display, including the plotting of charts with coastlines and of contoured data are described. Author

N82-13640# SACLANT ASW Research Center, La Spezia (Italy).
A REVIEW OF ONE-DIMENSIONAL OCEANIC MIXED-LAYER MODELS
Jon Moen 1 May 1981 50 p refs
(AD-A103279; SACLANTCEN-SR-47) Avail: NTIS HC A03/MF A01 CSCL 20/4

Available one dimensional mixed layer models are reviewed. A number of specific models, developed from a common set of basic equations, are discussed and compared. It is pointed out

that no particular mechanism has emerged to fully explain observations of 'slab like' (vertically uniform) flow in the mixed layer and so, despite the use of slab flow in simplifying bulk model equations, its cause has not been properly recognized. The results of the differential models do not predict slab-like flow unless the wind subsides. Author

N82-13641# Naval Oceanographic Office, Bay St. Louis, Miss. Environmental Systems Div.
ICAPS OCEANOGRAPHIC DATA FOR THE INDIAN OCEAN Final Report
Dec. 1980 93 p refs
(AD-A103173; NOO-RP-32C) Avail: NTIS HC A05/MF A01 CSCL 08/10

The integrated command ASW prediction system (ICAPS) oceanographic data files for the Indian Ocean are presented. Graphic displays provide an illustration of the historical data stored within the ICAPS data base. Depth, temperature and salinity values are shown on a split-depth scale providing a depiction of the near surface strucutre and a less detailed picture of the slowly varying deeper structure. The corresponding oceanograhic data for the Atlantic Ocean and Mediterranean Sea and Pacific Ocean are presented in companion publications. Author

N82-13642# Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
SURFACE SIGNS OF INTERNAL OCEAN DYNAMICS
Erik Mollo-Christensen 1980 8 p refs
(Contract N00014-80-C-0273)
(AD-A101380) Avail: NTIS HC A02/MF A01 CSCL 08/3

There are various processes internal to the ocean that can interact with the surface. The resulting interaction causes changes in the surface wave structure that may well be recognizable by remote sensing systems. Vertical motion occurs when a wind driven surface Ekman layer is set up. Such 'pumping' can also take place in deeper Ekman layers especially over sloping bottom surfaces. Internal waves, topographic waves, and current shear can also cause changes in the surface wave field. A combination of ship, buoy, and remote sensors like those aboard LANDSAT and Seasat, coupled with the output of modeling analyses, can immeasurably improve our knowledge of ocean dynamics. Author

N82-13643# Stockholm Univ. (Sweden). Dept. of Meteorology.
ON THE INADEQUACY OF ONE DIMENSIONAL OCEAN MODELS FOR THE GLOBAL CARBON CYCLE
Anders Bjoerkstroem 18 Feb. 1981 29 p refs
(CM-51) Avail: NTIS HC A03/MF A01

An attempt is made to estimate the free parameters in a model of the oceanic carbon cycle, using GEOSECS data. It turns out to be impossible to set the parameters in a way that is compatible with the observed distributions of carbon and oxygen simultaneously. The result indicates that it may not be possible for any horizontally homogeneous ocean model to depict the carbon cycle in a satisfactory way. A model where Antarctic water is treated separately is required. Author (ESA)

N82-13644# Florida Univ., Gainesville. Sea Grant College Program.
ARTIFICIAL REEFS: PROCEEDINGS OF A CONFERENCE
Donald Y. Aska, ed. Feb. 1981 240 p Conf. held at Daytona Beach, Fla., 13-15 Sep. 1979
(PB81-227779; FSG-R-41; NOAA-81052001; Rept-41) Avail: NTIS HC A11/MF A01 CSCL 08A

The conference dealt with a variety of perspectives on artificial reefs as an improvement on the natural habitat of fish, in various coastal areas. Subjects considered were: site selection, construction materials, economical and social aspects as well as planning and management for multiple use of such resources. Procedures for obtaining construction and use permits and relevant regulations are also given consideration. GRA

N82-13645 Delaware Univ., Newark.
THE PROPAGATION OF INERTIAL-INTERNAL WAVES IN COASTAL UPWELLING REGIONS Ph.D. Thesis
Walter Robertson Johnson 1981 311 p
Avail: Univ. Microfilms Order No. 8123817

It is hypothesized that near-inertial waves are responsible for propagation of significant amount of energy from the ocean surface mixed layer into the interior in coastal upwelling regions. It is suggested that these waves may impart some or all of their energy to other forms of oceanic motions, especially: mean flow at or near so-called critical surfaces, turbulent flow produced when the wave shear reduces the gradient Richardson number to less than a critical value, or turbulent flow produced through frictional dissipation at the shelf bottom. To investigate these effects, inertial-internal wave propagation was examined with ray calculations. The frequency and horizontal wave numbers were specified in the calculations, with the remainder of the propagation parameters, including vertical wave number, phase and group velocities calculated. Dissert. Abstr.

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N82-13646 Kansas State Univ., Manhattan.
ANALYTICAL DETECTION OF ORGANIC SPECIES BY MEANS OF LASER-INDUCED MULTIPHOTON IONIZATION Ph.D. Thesis
Richard Kenneth Simon, Jr. 1980 189 p
Avail: Univ. Microfilms Order No. 8122036

Multiphoton ionization (MP) is spectrometric technique which was developed for the the analysis of trace amounts of both atomic and molecules species. The methods is based on two or more photons being absorbed by the the analyte which results in the analyte being ionized. The intense photoexcitation of the analysis is achieved by focussing the output of a pulsed tunable dye laser in an ionization chamber. The ionization chamber serves as the analyte reservoir and allows detection of the resulting MP1 current pulse. The non-optical nature of the signal detection makes MP1 a novelspectroscopic technique: no optical collection, dispersion, and/or detection is required; scattered and stray light are irrelevant; vacuum ultraviolet spectroscopy in air possible without special optics. Dissert. Abstr.

N82-13647# Calspan Advanced Technology Center, Buffalo, N.Y.
MITIGATION OF BIOFOULING USING COATINGS Quarterly Progress Report
A. E. Meyer and R. W. King 22 Jun. 1981 13 p refs
(Contract DE-AC02-80ER-10766)
(DE81-027900; DOE/ER-10766/3; QPR-3) Avail: NTIS HC A02/MF A01

Progress is reported in a project in which the objectives are to evaluate benefits associated with control of the surface energetic properties of materials used in heat exchangers, and to identify preferred ranges of these surface conditions that minimize deposits of biological fouling known to deteriorate heat exchange efficiencis in seawater, brackish water and freshwater systems. The technical approach employed uses special diagnostic plates in novel flow cells where fluid flow conditions can be well-controlled, modifying the surface chemistry and surface energy of the plates with very thin coatings and examining the earliest events of biofouling caused by macromolecules and microbial organisms. Information is included on exposure experiments and results and heat exchange experiments. DOE

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N82-13648 Stanford Univ., Calif.
SUPERCONDUCTING MAGNETOMETRY FOR CARDIOVASCULAR STUDIES AND AN APPLICATION OF ADAPTIVE FILTERING Ph.D. Thesis
Mark Curtis Leifer 1981 174 p
Avail: Univ. Microfilms Order No. 8124101

Sensitive magnetic detectors utilizing Superconducting

Quantum interference Devices, studying the cardiovascular system were developed. The theory of magnetic detection of cardiac currents is discussed, and experimental data supporting the validity of the theory is presented. Measurements on both humans and dogs, in both healthy and diseased states, are presented using the technique, which is termed vector magnetocardiography. Performance of the actual device displays significantly improved sensitivity in this frequency range, and the ability to measure currents in intact, in vivo biological fibers. The theoretical operation of a digital self-optimizing filter is reviewed and a four-channel software implementation of the system is presented. The application of the adaptive filter to enhancement of geomagnetic signals for earthquake forecasting is discussed, and the adaptive filter is shown to outperform existing techniques in suppressing noise from geomagnetic records. Dissert. Abstr.

N82-13649# Armed Forces Radiobiology Research Inst., Bethesda, Md.

NEUROTRANSMITTER FUNCTION IN THE BASAL GANGLIA AFTER ACUTE AND CHRONIC ETHANOL TREATMENT

Walter A. Hunt Jul. 1981 10 p refs
(AD-A103744; AFRRI-SR81-19) Avail: NTIS HC A02/MF A01 CSCL 06/15

Acute and chronic administration of ethanol has multiple effects on several neurotransmitters in the basal ganglia. Dopamine is the transmitter predominantly affected. Acceleration of dopaminergic activity is observed at low doses of ethanol. However, at high doses the reverse is observed. During the ethanol withdrawal syndrome that develops after chronic treatment, dopaminergic responses are reduced, whether from presynaptic or postsynaptic origins. Ethanol induces a variety of alterations in neurotransmitter function as a result of its disruption of membrane structure and associated electrical properties. GRA

N82-13650# Naval Biodynamics Lab., New Orleans, La.

DETERMINATION OF EFFICIENT METHODS OF LIFT BY COMPARING TRAINED AND UNTRAINED MALE AND FEMALE LIFTERS Final Report

Richard H. Shannon 3 Dec. 1980 141 p refs
(AD-A100349; NBDL-M004) Avail: NTIS HC A07/MF A01 CSCL 06/14

The effects of sex and training variables during nonrepetitive, short duration lifts in the sagittal plane were analyzed. One half of each sex subsample was part of a lifting training program, while the other half was used as a control group. The effects of body movements by these subjects in the height ranges from the floor to the knuckle and the knuckle to the shoulder were ascertained with 10, 25, 40 pound weight loads. Muscular strain, stroboscopic photography to calculate differences in displacement time vectors, and the force platform to specify force changes at the feet were determined. The various statistical techniques applied were: factor analysis, regression analysis, analysis of variance, t-test and nonparametric statistics. The results are a five factor biomechanical model, regression equations predicting inertial forces at the hands, and significant differences between the untrained and trained conditions, and males and females. It is concluded that manual handling training programs are necessary in the work environment if women are expected to lift loads of approximately 40 pounds. Author

N82-13651# Australian Radiation Lab., Melbourne.

ABSORBED DOSE TO ACTIVE RED BONE MARROW FROM DIAGNOSTIC AND THERAPEUTIC USES OF RADIATION

S. B. Solomon and N. D. Morris Jun. 1980 34 p refs
(ARL-TR-021; ISSN-0157-1400) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The method of calculation of the radiation doses to the active bone marrow from diagnostic radiography, fluorescopy and radiotherapy is described. The bone marrow dose arising from radiological procedures Australia was determined as part of a survey of population doses. The results of the calculations are compared with the results of other models of bone marrow dose for a number of diagnostic X-ray procedures. DOE

N82-13652# Oak Ridge National Lab., Tenn.

HEALTH AND SAFETY RESEARCH DIVISION Progress Report, 1 Oct. 1979 - 31 Mar. 1981

Aug. 1981 109 p refs
(Contract W-7405-eng-26)
(DE81-026088; ORNL-5750) Avail: NTIS HC A06/MF A01

Progress in health and safety research is reported. A summary of the major fields covered includes: basic research in physical sciences, life sciences research and assessment, and multidisciplinary studies on the impact of alternative energy technology and policy options. E.A.K.

N82-13653# Ingenieurbuero fuer Ergonomie, Munich (West Germany).

INFLUENCE OF SINE, AND RANDOM, WHOLE-BODY VIBRATION ON VISUAL ACUITY [EINFLUSS SINUSFOERMIGER UND REGELLOSER GANZKOERPERSCHWINGUNGEN AUF DIE VISUELLE INFORMATIONSAUFNAHME]

Norbert May Bonn Bundesministerium der Verteidigung 1979 101 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung
(BMVg-FBWT-79-17) Avail: NTIS HC A06/MF A01; DOKZENTBw, Bonn DM 30

The far, visual acuity of people subjected to vertical whole-body vibration (different vibration types and loads) was tested. A total of 110 subjects of both sexes, either exposed to sine vibration in the range from 2 to 18 cycles/sec or to random vibrations in the same frequency range, participated. The rms accelerations on the heads of subjects were 0.17, 0.3 and 0.43 m/sec squared. The subjects sat erect on an uncushioned seat, mounted on a hydromechanical vibration apparatus. Results show that relative visual acuity diminishes with sine vibrations while increasing frequency and/or accelerations (from 6% minimum to 37.5 % maximum of visual acuity under static conditions). With random vibrations there is also an acuity decrease although smaller, while increasing the vibration frequency as well as with increasing acceleration load. Author (ESA)

N82-13654# Freie Univ., Berlin (West Germany). Physiologisches Inst.

THE MEASUREMENTS OF FLUID SHIFTS AND OF THE TISSUE COMPLIANCE ALONG BODY AXIS IN MAN Final Report

Karl Kirsch Bonn Bundesministerium fuer Forschung und Technologie Sep. 1980 41 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-80-011; ISSN-0170-1339) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8.60

Tissue volume changes on different parts of the body were simultaneously measured by ultrasonic techniques in order to monitor the shift of fluid volumes along the body axis. Once fully established, the method could be used for measuring the shift of blood and interstitial fluid from the lower to the cephalic part of the body, occurring under zero-gravity conditions. Proof of principle tests were carried out under orthostatis, immersion and heat exposure conditions were confirmed by post mortem comparisons. By mounting the measuring probe in an airtight chamber, the tissue compliance C = dV/dP was also determined. The results found are consistent with previous investigations and with clinical tests. Application in space and as a circulation diagnostic method is advocated. Author (ESA)

N82-13655# Environmental Protection Agency, Washington, D.C. Dept. of Biology.

METABOLISM SUMMARIES OF SELECTED HALOGENATED ORGANIC COMPOUNDS IN HUMAN AND ENVIRONMENTAL MEDIA, A LITERATURE SURVEY: FIRST UPDATE Final Report

Syed M. Naqvi and Marion C. Blois Dec. 1980 44 p refs
(PB81-232811; EPA-560/13-79-018) Avail: NTIS HC A03/MF A01 CSCL 06T

Metabolism summaries as well as basic information on the physical properties of 19 halocarbons are presented. Molecular and structural formulas, the Chemical Astracts Registry number, accepted synomyns, molecular weight, boiling point, and vapor pressure are included. Information on the uptake and retention of the compound, its subsequent distribution and elimination patterns, the identification and observed concentrations of

metabolites, and the metabolic pathways involved is provided.
S.L.

N82-13656 California Univ., Los Angeles.
A MONITOR FOR NONINVASIVE ESTIMATION OF PULMONARY BLOOD FLOW Ph.D. Thesis
Luigi Arena 1981 224 p
Avail: Univ. Microfilms Order No. 8122798

The design and the evaluation of a digital based monitoring device implementing a technique for the noninvasive estimation of pulmonary perfusion are described. This technique proved reliable in preliminary off-line experiments, however many engineering questions must be resolved before this principle can be transformed into a clinically useful device. Three main aspects of this study were identified model simulation, development and test of the instrumentation and clinical experiments.
Dissert. Abstr.

N82-13657 Northeastern Univ., Boston, Mass.
LINGUISTIC AND HUMAN PERFORMANCE CONSIDERATIONS IN THE DESIGN OF AN ANTICIPATORY COMMUNICATION AID Ph.D. Thesis
Clinton David Gibler 1981 365 p
Avail: Univ. Microfilms Order No. 8124891

A communication aid is a device that assists a disabled person with the generation of messages. A scanning aid presents language elements (e.g., letters, words) in a sequential fashion to accommodate those whose disability does not permit the direct selection of language elements. Anticipatory methods utilize statistical characteristics of language to shorten the average sequential access time to each language element. The study is restricted to those aids having the capacity for English text generation. The research yielded two developments: a small, general purpose dictionary that accounts for a high percent .ge of a person's vocabulary; and a human performance model that accurately predicts communication rates for the transcription task, given basic human performance data about the user.
Dissert. Abstr.

N82-13658 Stanford Univ., Calif.
A SYSTEMS ANALYSIS OF THE MATURATION OF SLEEP USING A SEMI-MARKOV MODEL Ph.D. Thesis
Thomas Raymond Bowe 1981 122 p
Avail: Univ. Microfilms Order No. 8124040

An approach to analyze the sleep process in human infants is presented. In particular it formulates phase varying semi-Markov models for infants at 2, 4, 8, 20, 24, 36, and 52 weeks of age. The Bayesian estimation procedure employed allows the uncertainty in the estimated parameters to be quantitized. The parameters of the models represent the basic building blocks of the sleep process and can be used to predict any statistic of interest. The models were used to investigate the rhythmic nature of the sleep process. The concept that sleep develops a periodic tendency was mathematically investigated and defined.
Dissert. Abstr.

N82-13659 Syracuse Univ., N. Y.
DEPOSITION OF AEROSOL PARTICLES IN THE HUMAN RESPIRATORY TRACT Ph.D. Thesis
Shii-Pyng Shiah 1981 192 p
Avail: Univ. Microfilms Order No. 8123939

The dispersion and deposition of aerosol particles in human lungs are investigated. The development of a three dimensional airway model, the dispersion of half micrometer particles in the respiratory tract, and deposition of aerosol particles in the respiratory tract are studied. A model of the upper tracheobronchial tree is constructed to account for the three dimensional nature of the airway system. A mathematical model is developed for predicting the percentage of inhaled hygrocopic particles which deposit in each generation of the repeatedly bifurcating tubes in an airway tree. A theoretical model of aerosol dispersion in the human lungs is extended to the alveolated regions by considering the expansion and contraction of the alveoli. The percentage of inhaled paticles which deposit in each generation of tubes is calculated for all generations reached by the inhaled aerosols.
Dissert. Abstr.

N82-13660 Northwestern Univ., Evanston, Ill.
DYNAMIC MEASUREMENT OF HUMAN VERTICAL FUSIONAL RESPONSE Ph.D. Thesis
Arye Lipa Perlmutter 1981 88 p
Avail: Univ. Microfilms Order No. 8124975

The response was studied in order to explore the relationship between its sensory and motor components. Two SRI Double Purkinje Image Eyetrackers were used for binocular recordings of eye movements in response to the presentations of vertical disparities. The binocular coordination of vertical fusional responses were studied through the presentations of asymmetrical disparities as well as predictable and unpredictable symmetrical sinusoidal disparities. The motor response to asymmetrical disparity presentation is found to be incomplete, thus allowing for the existence of a significant sensory component. When ramp disparities were presented only the eye whose monocular image moved followed the stimulus closely while the other eye did not move or moved by a small amount.
Dissert. Abstr.

N82-13661 Stanford Univ., Calif.
ALGORITHMS FOR IMAGING MYOCARDIAL BLOOD FLOW USING X-RAY COMPUTED TOMOGRAPHY Ph.D. Thesis
Menahem Nassi-F 1981 136 p
Avail: Univ. Microfilms Order No. 8124117

Algorithms are proposed to remove degradation of contrast and spatial resolution produced by the motion of the heart in X-ray computed tomography. A mathematical model is derived for regional myocardial blood flow (RMBF) estimation which uses a classical, deterministic formulation to describe tracer dynamics in the myocardium. Based upon the perfect mixing assumption, this theory removes the requirement for intra-arterial bolus injection of tracer (diatrizoate radiographic contrast). Regional partition coefficients are estimated, which render absolute RMBF estimates [ml/(min x gr)]. The requirement for curve extrapolation (zeroth and first moment computation) in the presence of recirculation, and the considerable measurement noise which is unaccounted for, are both removed by the proposed alternative stochastic formulation.
Dissert. Abstr.

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

No abstracts in this category.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N82-13662*# Ohio State Univ., Columbus. Dept. of Industrial and Systems Engineering.
AN INVESTIGATION INTO PILOT AND SYSTEM RESPONSE TO CRITICAL IN-FLIGHT EVENTS, VOLUME 1 Final Report, 27 Oct. 1978 - 26 Jun. 1981
Thomas H. Rockwell and Walter C. Giffin Jun. 1981 200 p refs 2 Vol.
(Contract NAS2-10047; Grant NAG2-75; RF Proj. 761415/711621; RF Proj. 762501/713447)
(NASA-CR-166243-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 05H

The scope of a critical in-flight event (CIFE) with emphasis on pilot management of available resources is described. Detailed scenarios for both full mission simulation and written testing of pilot responses to CIFE's, and statistical relationships among pilot characteristics and observed responses are developed. A model developed to described pilot response to CIFE and an analysis of professional fight crews compliance with specified operating

procedures and the relationships with in-flight errors are included. S.L.

N82-13663*# Ohio State Univ., Columbus. Dept. of Industrial and Systems Engineering.
AN INVESTIGATION INTO PILOT AND SYSTEM RESPONSE TO CRITICAL IN-FLIGHT EVENTS, VOLUME 2 Final Report, 27 Oct. 1978 - 26 Jun. 1981
Thomas H. Rockwell and Walter C. Giffin Jun. 1981 151 p 2 Vol.
(Contract NAS2-10047; Grant NAG2-75; RF Proj. 761415/711621; RF Proj. 762501/713447)
(NASA-CR-166243-Vol-2) Avail: NTIS HC A08/MF A01 CSCL 05H

Critical in-flight event is studied using mission simulation and written tests of pilot responses. Materials and procedures used in knowledge tests, written tests, and mission simulations are included. S.L.

N82-13664*# Computer Sciences Corp., Mountain View, Calif.
VISUAL/MOTION CUE MISMATCH IN A COORDINATED ROLL MANEUVER
Douglas K. Shirachi and Richard S. Shirley May 1981 51 p
(Contract NAS2-9741)
(NASA-CR-166259; CSCR-9) Avail: NTIS HC A04/MF A01 CSCL 05H

The effects of bandwidth differences between visual and motion cueing systems on pilot performance for a coordinated roll task were investigated. Visual and motion cue configurations which were acceptable and the effects of reduced motion cue scaling on pilot performance were studied to determine the scale reduction threshold for which pilot performance was significantly different from full scale pilot performance. It is concluded that: (1) the presence or absence of high frequency error information in the visual and/or motion display systems significantly affects pilot performance; and (2) the attenuation of motion scaling while maintaining other display dynamic characteristics constant, affects pilot performance. E.A.K.

N82-13665*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROCEEDINGS OF THE SEVENTEENTH ANNUAL CONFERENCE ON MANUAL CONTROL
15 Oct. 1981 693 p refs Conf. held in Los Angeles, 16-18 Jun. 1981; sponsored by NASA and ONR
(Contract NAS7-100)
(NASA-CR-165005; JPL-Pub-81-95) Avail: NTIS HC A99/MF A01 CSCL 05H

Manual control is considered, with concentration on perceptive/cognitive man-machine interaction and interface. For individual titles, see N82-13666 through N82-13723.

N82-13666*# California Univ., Los Angeles. Brain Research Inst.
PUPILLOMETRIC MEASUREMENT OF OPERATOR WORKLOAD
Jackson Beatty *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 1-6 refs (For primary document see N82-13665 04-54)
(Contract N00014-76-C-0616)
Avail: NTIS HC A99/MF A01 CSCL 05/4

Pupillometry as a method of measuring workload is described. Pupillometric measures provide an indication of momentary fluctuations in central nervous system excitability that occur as cognitive operations are performed; the magnitude of these changes may serve as a sensitive indicator of the workload imposed by cognitive tasks. J.D.H.

N82-13667*# Illinois Univ., Champaign. Dept. of Psychology.
THE COGNITIVE DEMANDS OF SECOND ORDER MANUAL CONTROL: APPLICATIONS OF THE EVENT RELATED BRAIN POTENTIAL
Christopher Wickens, Richard Gill, Arthur Kramer, William Ross, and Emanuel Donchin *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 7-16 refs (For primary document see N82-13665 04-54)
(Contract F49620-79-C-0233)
Avail: NTIS HC A99/MF A01 CSCL 05H

Three experiments are described in which tracking difficulty is varied in the presence of a covert tone discrimination task. Event related brain potentials (ERPs) elicited by the tones are employed as an index of the resource demands of tracking. The ERP measure reflected the control order variation, and this variable was thereby assumed to compete for perceptual/central processing resources. A fine-grained analysis of the results suggested that the primary demands of second order tracking involve the central processing operations of maintaining a more complex internal model of the dynamic system, rather than the perceptual demands of higher derivative perception. Experiment 3 varied tracking bandwidth in random input tracking, and the ERP was unaffected. Bandwidth was then inferred to compete for response-related processing resources that are independent of the ERP. J.D.H.

N82-13668*# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
A STUDY ON TASK DIFFICULTY AND ACCELERATION STRESS
D. W. Repperger and D. B. Rogers *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 17-31 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The results of two experiments which relate to task difficulty and the effects of environmental stress on tracking performance are discussed and compared to subjective evaluations. The first experiment involved five different sum of sine tracking tasks which humans tracked both in a static condition and under a 5 Gz acceleration stress condition. The second experiment involved similar environmental stress conditions but in this case the tasks were constructed from deterministic functions with specially designed velocity and acceleration profiles. Phase Plane performance analysis was conducted to study potential measures of workload or tracking difficulty. J.D.H.

N82-13669*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SUBJECTIVE RATING SCALES AS A WORKLOAD
Kathleen L. Bird (Virginia Polytechnic Inst. and State Univ.) *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 33-39 refs (For primary document see N82-13665 04-54)
(Contract NAG1-217)
Avail: NTIS HC A99/MF A01 CSCL 05H

A multidimensional bipolar-adjective rating scale is employed as a subjective measure of operator workload in the performance of a one-axis tracking task. The rating scale addressed several dimensions of workload, including cognitive, physical, and perceptual task loading as well as fatigue and stress effects. Eight subjects performed a one-axis tracking task (with six levels of difficulty) and rated these tasks on several workload dimensions. Performance measures were tracking error RMS (root-mean square) and the standard deviation of control stick output. Significant relationships were observed between these performance measures and skill required, task complexity, attention level, task difficulty, task demands, and stress level. Author

N82-13670*# California Univ., Los Angeles.
PHYSIOLOGICAL ASSESSMENT OF OPERATOR WORKLOAD DURING MANUAL TRACKING. 1: PUPILLARY RESPONSES
Quiyan Jiang, Raja Parasuraman, and Jackson Beatty *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 41-46 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The feasibility of pupillometry as an indicator for assessing operator workload during manual tracking was studied. The mean and maximum pupillary responses of 12 subjects performing tracking tasks with three levels of difficulty (bandwidth of the forcing function were 0.15, 0.30 and 0.50 Hz respectively) were analysed. The results showed that pupillary dilation increased significantly as a function of the tracking difficulty which was reflected by the significant increase of tracking error (RMS). The present study supplies additional evidence that pupillary response is a sensitive and reliable index which may serve as an indicator for assessing operator workload in man-machine systems.Author

N82-13671*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HORIZONTAL CONFLICT RESOLUTION MANEUVERS WITH A COCKPIT DISPLAY OF TRAFFIC INFORMATION
Evertt Palmer, Sharon Jago, and Myrna DuBord *In* JPL Proc. of the 17th Ann. Conf. on Manual control 15 Oct. 1981 p 51-62 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

Pilot resolution of potential conflicts in the horizontal plane when the only information available on the other aircraft was presented on a Cockpit Display of Traffic Information (CDTI) is investigated. The pilot's task was to assess the situation and if necessary maneuver so as to avoid the other aircraft. No instructions were given on evasive strategy or on what was considered to be an acceptable minimum separation. The results indicate that pilots had a strong bias of turning toward the intruder aircraft in order to pass behind it. In more than 50% of the encounters with a 90 degree crossing angle in which the intruder aircraft was programmed to pass behind the aircraft, the pilots maneuvered so as to pass behind the intruder. This bias was not as strong with the display which showed a prediction of the intruder's relative velocity. The average miss distance for all encounters was about 4500 feet. J.D.H.

N82-13672*# Grumman Aerospace Corp., Bethpage, N.Y.
SOME EFFECTS OF FIELD OF VIEW (FOV) AND TARGET SIZE ON LATERAL TRACKING AT HOVER
Harry T. Breul *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 63-75 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

An exploratory flight-simulator experiment examined the gross effects of several factors potentially important to the design of a visual display system for aiding VTOL pilots in the difficult task of landing on a small sea-control ship. Field of view (FOV) and target size were the primary variables examined for a lateral tracking task in a full motion 5 degree-of-freedom hover simulation. The mean absolute value of tracking error was used to measure tracking performance, and cross spectral transfer function analysis was performed to determine the pilot's ability to generate good open-loop transfer function characteristics as a function of the experimental variables. It was found that FOV and target size can have a large effect on the pilot's ability to generate open-loop gain, and on his tracking performance. J.D.H.

N82-13673*# Linkabit Corp., San Diego, Calif.
VIDEO FRAMERATE, RESOLUTION AND GRAYSCALE TRADEOFFS FOR UNDERSEA TELEMANIPULATOR
Vivek Ranadive and Thomas B. Sheridan *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 77-88 refs Prepared in cooperation with MIT, Cambridge (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The product of Frame Rate (F) in frames per second, Resolution (R) in total pixels and grayscale in bits (G) equals the transmission band rate in bits per second. Thus for a fixed channel capacity there are tradeoffs between F, R and G in the actual sampling of the picture for a particular manual control task in the present case remote undersea manipulation. A manipulator was used in the MASTER/SLAVE mode to study these tradeoffs. Images were systematically degraded from 28 frames per second, 128 x 128 pixels and 16 levels (4 bits) grayscale, with various FRG combinations constructed from a real-time digitized (charge-injection) video camera. It was found that frame rate, resolution and grayscale could be independently reduced without preventing the operator from accomplishing his/her task. Threshold points were found beyond which degradation would prevent any successful performance. A general conclusion is that a well trained operator can perform familiar remote manipulator tasks with a considerably degrade picture, down to 50 K bits/ sec. J.D.H.

N82-13674*# Technion - Israel Inst. of Tech., Haifa.
PREDICTOR SYMBOLOGY IN COMPUTER-GENERATED PERSPECTIVE DISPLAYS
Arthur J. Grunwald *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 89-94 ref (For primary document see N82-13665 04-54)
(Contract NASw-3302)
Avail: NTIS HC A99/MF A01 CSCL 05H

An advanced diplay format for the four dimensional commercial aircraft approach-to-landing is evaluated. The desired curved and descending approach path is presented by displaying the perspective image of a tunnel. Attention is focussed on the predictor symbology, superimposed on the tunnel image. A perspective three dimensional predictor symbol, providing future position, as well as future attitude information, is compared with a flat two dimensional version, which only provides the future position. In addition to this, the predictor displays the actual airspeed as well as the desired airspeed, prescribed by the four dimensional path. Results show that the three dimensional predictor symbol outperforms the two dimensional predictor in following the trajectory in a moderate-to-heavy turbulent environment, which is manifested in accurate manual true airspeed control was obtained without affecting the main task performance significantly. Author

N82-13675*# New Mexico Univ., Albuquerque. Dept. of Mechanical Engineering.
SUPERVISORY CONTROL OF REMOTE MANIPULATION: A PRELIMINARY EVALUATION
Gregory P. Starr *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 95-107 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A system for supervisory control is described, and preliminary results are presented. Supervisory control, where control is traded between man and computer, offers benefits in the control of a remote manipulator. The system has the potential to accomplish sophisticated tasks. It is indicated that supervisory control yields lower task completion times and is preferred over manual control. E.A.K.

N82-13676*# California Univ., Los Angeles. Dept. of Engineering Systems.
RESEARCH ISSUES IN IMPLEMENTING REMOTE PRESENCE IN TELEOPERATOR CONTROL
Kevin Corker, Andrew H. Mishkin, and John Lyman *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 109-126 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The concept of remote presence in telemanipulation is presented. A conceptual design of a prototype teleoperator system incorporating remote presence is described. The design is presented in functional terms, sensor, display, and control subsystem. An intermediate environment, in which the human operator is made to feel present, is explicated. The intermediate environment differs from the task environment due to the quantity and type of information presented to an operator and due to scaling factors protecting the operator from the hazards of the task environment. Potential benefits of remote presence systems, both for manipulation and for the study of human cognition and preception are discussed. E.A.K.

N82-13677*# Paris XII Univ., Evry (France).
THE PERSISTENCE OF A VISUAL DOMINANCE EFFECT IN A TELEMANIPULATOR TASK: A COMPARISON BETWEEN VISUAL AND ELECTROTACTILE FEEDBACK
J. P. Gaillard *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 127-138 refs Sponsored in part by Direction de la Recherche des Equipements Techniques (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The possibility to use an electrotactile stimulation in teleoperation and to observe the interpretation of such information as a feedback to the operator was investigated. It is proposed that visual feedback is more informative than an electrotactile one; and that complex electrotactile feedback slows down both the motor decision and motor response processes, is processed as an all or nothing signal, and bypasses the receptive structure and accesses directly in a working memory where information is sequentially processed and where memory is limited in treatment capacity. The electrotactile stimulation is used as an alerting signal. It is suggested that the visual dominance effect is the result of the advantage of both a transfer function and a sensory memory register where information is pretreated and memorized for a short time. It is found that dividing attention has an effect

on the acquisition of the information but not on the subsequent decision processes. E.A.K.

N82-13678*# Oak Ridge National Lab., Tenn. Fuel Recycle Div.

MAN/MACHINE INTERFACE DEVELOPMENT FOR THE REMOTEX CONCEPT

J. Garin and M. M. Clarke (Oak Ridge Associated Universities) *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 139-144 refs (For primary document see N82-13665 04-54)

(Contract W-7405-eng-26)

Avail: NTIS HC A99/MF A01 CSCL 05H

The development of a man/machine interface system that can be used to remotely control a system composed of a transporter base and a force-reflecting, survocontrolled manipulator is reported. The concept features the incorporation of totally remote operation. A simulator is build to optimize man/machine interface requirements. E.A.K.

N82-13679*# Oak Ridge Associated Universities, Tenn.

IDENTIFICATION OF COGNITIVE FACTORS RELATED TO REMOTE WORK PERFORMANCE USING CLOSED CIRCUIT TV DISPLAYS

M. M. Clarke and J. Garin (ORNL) *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 145-148 refs (For primary document see N82-13665 04-54)

(Contract W-7405-eng-26)

Avail: NTIS HC A99/MF A01 CSCL 05H

Operator perceptual cognitive styles as predictors of remote task performance were identified. Remote tasks which require the use of servo controlled master/slave manipulators and closed circuit television for teleoperator repair and maintenance of nuclear fuel recycling systems are examined. A useful procedure for identifying such perceptual styles is described. E.A.K.

N82-13680*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

SIMPLE GEOMETRIC ALGORITHMS TO AID IN CLEARANCE MANAGEMENT FOR ROBOTIC MECHANISMS

E. L. Copeland, L. D. Ray, and J. D. Peticolas *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 149-155 (For primary document see N82-13665 04-54)

Avail: NTIS HC A99/MF A01 CSCL 05H

Global geometric shapes such as lines, planes, circles, spheres, cylinders, and the associated computational algorithms which provide relatively inexpensive estimates of minimum spatial clearance for safe operations were selected. The Space Shuttle, remote manipulator system, and the Power Extension Package are used as an example. Robotic mechanisms operate in quarters limited by external structures and the problem of clearance is often of considerable interest. Safe clearance management is simple and suited to real time calculation, whereas contact prediction requires more precision, sophistication, and computational overhead. E.A.K.

N82-13681*# General Motors Research Labs., Warren, Mich. Engineering Mechanics Dept.

THE INFLUENCE OF MOTION CUES ON DRIVER-VEHICLE PERFORMANCE IN A SIMULATOR

Brian S. Repa, Philip M. Leucht, and Walter W. Wierwille (Virginia Polytechnic Inst. and State Univ.) *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 157-169 refs (For primary document see N82-13665 04-54)

Avail: NTIS HC A99/MF A01 CSCL 05H

Four different motion base configurations were studied on driving simulator. Differently responding vehicles were simulated on each motion configurations and the effects of the vehicle characteristics on driver vehicle system performance, driver control activity, and driver opinion ratings of vehicle performance during driving are compared for different motion configurations. Data show that: (1)) the effects of changes in vehicle characteristics on the different objective and subjective measures of driver vehicle performance are not disguised by the lack of physical motion; (2) fixed base simulator can be used to draw inferences despite the lack of motion; (3) the presence of motion tends to reduce path keeping errors and driver control activity; (4) roll and yaw motions are recommended because of their marked influence on driver vehicle performance (5) the importance of motion increases as the driving maneuvers become more extreme. E.A.K.

N82-13682*# Lockheed-California Co., Burbank.

MULTIPLE MAN-MACHINE INTERFACES

Lillian Stanton and Creighton W. Cook *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 171-186 refs (For primary document see N82-13665 04-54)

Avail: NTIS HC A99/MF A01 CSCL 05H

The multiple man machine interfaces inherent in military pilot training, their social implications, and the issue of possible negative feedback were explored. Modern technology has produced machines which can see, hear, and touch with greater accuracy and precision than human beings. Consequently, the military pilot is more a systems manager, often doing battle against a target he never sees. It is concluded that unquantifiable human activity requires motivation that is not intrinsic in a machine. E.A.K.

N82-13683*# Perceptronics, Inc., Woodland Hills, Calif.

DECISION AIDS FOR AIRBORNE INTERCEPT OPERATIONS IN ADVANCED AIRCRAFTS

Azad Madni and Amos Freedy *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 187-209 refs (For primary document see N82-13665 04-54)

(Contract N62269-79-C-0496)

Avail: NTIS HC A99/MF A01 CSCL 05H

A tactical decision aid (TDA) for the F-14 aircrew, i.e., the naval flight officer and pilot, in conducting a multitarget attack during the performance of a Combat Air Patrol (CAP) role is presented. The TDA employs hierarchical multiattribute utility models for characterizing mission objectives in operationally measurable terms, rule based AI-models for tactical posture selection, and fast time simulation for maneuver consequence prediction. The TDA makes aspect maneuver recommendations, selects and displays the optimum mission posture, evaluates attackable and potentially attackable subsets, and recommends the 'best' attackable subset along with the required course perturbation. E.A.K.

N82-13684*# Systems Technology, Inc., Hawthorne, Calif.

USING REWARDS AND PENALTIES TO OBTAIN DESIRED SUBJECT PERFORMANCE

Marcia Cook, Henry R. Jex, Anthony C. Stein, and R. Wade Allen *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Dec. 1981 p 211-222 refs (For primary document see N82-13665 04-54)

Avail: NTIS HC A99/MF A01 CSCL 05H

Operant conditioning procedures, specifically the use of negative reinforcement, in achieving stable learning behavior is described. The critical tracking test (CTT) a method of detecting human operator impairment was tested. A pass level is set for each subject, based on that subject's asymptotic skill level while sober. It is critical that complete training take place before the individualized pass level is set in order that the impairment can be detected. The results provide a more general basis for the application of reward/penalty structures in manual control research. E.A.K.

N82-13685*# Systems Technology, Inc., Mountain View, Calif.

A COMPARISON OF LANDING MANEUVER PILOTING TECHNIQUE BASED ON MEASUREMENTS MADE IN AN AIRLINE TRAINING SIMULATOR AND IN ACTUAL FLIGHT

Robert K. Heffley and Ted M. Schulman *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 223-234 refs (For primary document see N82-13665 04-54)

Avail: NTIS HC A99/MF A01 CSCL 05H

An emphasis is placed on developing a mathematical model in order to identify useful metrics, quantify piloting technique, and define simulator fidelity. On the basis of DC-10 flight measurements recorded for 32 pilots, 13 flight-trained and the remainder simulator trained, a revised model of the landing flare is hypothesized which accounts for reduction of sink rate and perference for touchdown point along the runway. The flare maneuver and touchdown point adjustment can be described by a pitch attitude command pilot guidance law consisting of altitude

and vertical velocity feedbacks. In flight pilots exhibit a significant vertical velocity feedback which is essential for well controlled sink rate reduction at the desired level of response (bandwidth). In the simulator, however, the vertical velocity feedback appears ineffectual and leads to substantially inferior landing performance. T.M.

N82-13686*# Systems Technology, Inc., Mountain View, Calif.
IDENTIFICATION OF MULTILOOP PILOT DESCRIBING FUNCTIONS OBTAINED FROM SIMULATED APPROACHES TO AN AIRCRAFT CARRIER
Wayne F. Jewell *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 239-244 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

Predicted results of a simulation of the pilot's approach control strategy in the presence of pilot remnant are presented. The aircraft dynamics and the turbulence environment are representative of a trainer-type aircraft. The non-intrusive pilot identification program (NIPIP) was used to identify the pilot's control strategy required by this highly-coupled, multiloop control task. The results are presented in terms of frequency responses of the individual elements of the pilot's control strategy and indicate that NIPIP can identify the pilot's describing functions even in the presence of significant amounts of pilot remnant. T.M.

N82-13687*# Douglas Aircraft Co., Inc., Long Beach, Calif.
FURTHER TESTS OF A MODEL-BASED SCHEME FOR PREDICTING PILOT OPINION RATINGS FOR LARGE COMMERCIAL TRANSPORTS
W. W. Rickard and W. H. Levison (Bolt, Beranek and Newman, Inc., Cambridge, Mass.) *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 245-254 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A methodology was demonstrated for assessing longitudinal-axis handling qualities of transport aircraft on the basis of closed-loop criteria. Six longitudinal-axis approach configurations were studied covering a range of handling quality problems that included the presence of flexible aircraft modes. Using closed-loop performance requirements derived from task analyses and pilot interviews, predictions of performance/workload tradeoffs were obtained using an analytical pilot/vehicle model. A subsequent manned simulation study yielded objective performance measures and Cooper-Harper pilot ratings that were largely consistent with each other and with analytic predictions. T.M.

N82-13688*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN ANALYTICAL APPROACH FOR PREDICTING PILOT INDUCED OSCILLATIONS
Ronald A. Hess *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 235-269 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The optimal control model (OCM) of the human pilot is applied to the study of aircraft handling qualities. Attention is focused primarily on longitudinal tasks. The modeling technique differs from previous applications of the OCM in that considerable effort is expended in simplifying the pilot/vehicle analysis. After briefly reviewing the OCM, a technique for modeling the pilot controlling higher order systems is introduced. Following this, a simple criterion or determining the susceptability of an aircraft to pilot induced oscillations (PIO) is formulated. Finally, a model-based metric for pilot rating prediction is discussed. The resulting modeling procedure provides a relatively simple, yet unified approach to the study of a variety of handling qualities problems. T.M.

N82-13689*# Operations Research, Inc., Bethesda, Md.
A MODEL FOR THE SUBMARINE DEPTHKEEPING TEAM
John R. Ware, John F. Best, Pamela J. Bozzi, and David W. Kleinman (Connecticut Univ., Storrs) *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 271-282 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The most difficult task the depthkeeping team must face occurs during periscope-depth operations during which they may be required to maintain a submarine several hundred feet long within a foot of ordered depth and within one-half degree of ordered pitch. The difficulty is compounded by the facts that wave generated forces are extremely high, depth and pitch signals are very noisy and submarine speed is such that overall dynamics are slow. A mathematical simulation of the depthkeeping team based on the optimal control models is described. A solution of the optimal team control problem with an output control restriction (limited display to each controller) is presented. T.M.

N82-13690*# Analytical Mechanics Associates, Inc., Mountain View, Calif.
MODELING OF THE AIRCRAFT IN-TRAIL-FOLLOWING TASK DURING PROFILE DESCENT
T. Goka, J. A. Sorensen, and A. V. Phatak *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 283-294 refs (For primary document see N82-13665 04-54)
(Contract NAS1-16135)
Avail: NTIS HC A99/MF A01 CSCL 05H

The cockpit display of traffic information (CDTI) system concepts enable the pilot to observe the surrounding air traffic pattern. The impact of such a system is far reaching in terms of improved safety, pilot and controller workload, and aircraft fuel efficiency. One direct payoff is the ability to distribute the ATC workload to the pilot in such tasks as merging and spacing. The CDTI application of spacing approach aircraft in the terminal area is addressed. In-trail-following/CDTI experiments were performed using realistic cockpit simulators and profile descent approach scenarios. Based on collected experimental simulator data, pilot models were developed which include state estimation, decision making and flight control aspects. These models were coupled with models of aircraft and CDTI equipment to study the dynamic phenomena and stability of strings of aircraft along various approach patterns. T.M.

N82-13691*# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
COMPARISON OF CLOSED LOOP MODEL WITH FLIGHT TEST RESULTS
Frank L. George *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 295-300 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

An analytic technique capable of predicting the landing characteristics of proposed aircraft configurations in the early stages of design was developed. In this analysis, a linear pilot-aircraft closed loop model was evaluated using experimental data generated with the NT-33 variable stability in-flight simulator. The pilot dynamics are modeled as inner and outer servo loop closures around aircraft pitch attitude, and altitude rate-of-change respectively. The landing flare maneuver is of particular interest as recent experience with military and other highly augmented vehicles shows this task to be relatively demanding, and potentially a critical design point. A unique feature of the pilot model is the incorporation of an internal model of the pilot's desired flight path for the flare maneuver. T.M.

N82-13692*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FUNCTIONAL STRUCTURE AND DYNAMICS OF THE HUMAN NERVOUS SYSTEM
Joseph A. Lawrence *In its* Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 301-304 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The status of an effort to define the directions needed to take in extending pilot models is reported. These models are needed to perform closed-loop (man-in-the-loop) feedback flight control system designs and to develop cockpit display requirements. The approach taken is to develop a hypothetical working model of the human nervous system by reviewing the current literature in neurology and psychology and to develop a computer model of this hypothetical working model. T.M.

N82-13693*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
ON THE USE OF THE OCM'S QUADRATIC OBJECTIVE FUNCTION AS A PILOT RATING METRIC

David K. Schmidt *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 305-313 refs (For primary document see N82-13665 04-54)
(Grant NAG4-1)
Avail: NTIS HC A99/MF A01 CSCL 05H

A correlation between the magnitude of the quadratic objective function from an optimal control pilot model and the subjective rating of the vehicle and task provides a valuable tool for handling qualities research and flight control synthesis. An analysis of simulation results for fourteen aircraft configurations flight tested earlier was conducted. A fixed set of pilot model parameters, are found for all cases in modeling the simulated regulation task. The agreement obtained between performance statistics is shown and a strong correlation was obtained between the cost function and rating. T.M.

N82-13694*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
A QUASI-NEWTON PROCEDURE FOR IDENTIFYING PILOT-RELATED PARAMETERS OF THE OPTIMAL CONTROL MODEL
William H. Levison *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 315-328 refs (For primary document see N82-13665 04-54)
(Contract F49620-8-C-0073)
Avail: NTIS HC A99/MF A01 CSCL 05H

The development and application of a quasi-Newton gradient search procedure for identifying independent pilot related parameters of the optimal control model for pilot/vehicle systems is reported. A sensitivity analysis procedure which determines whether a given model parameter is required to match a specific experimental result, and which experimentally induced parameter changes are required to account for behavioral and performance differences, is described. Application of the identification scheme to training effects in a manual control task is described. S.L.

N82-13695*# Connecticut Univ., Storrs.
INFORMATION AND DISPLAY REQUIREMENTS FOR AIRCRAFT TERRAIN FOLLOWING
D. L. Kleinman and J. Korn (ALPHATECH, Inc., Burlington, Mass.) *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 329-331 refs (For primary document see N82-13665 04-54)
(Contract F33615-80-C-0528)
Avail: NTIS HC A99/MF A01 CSCL 05H

The display design procedure for manned vehicle systems, is applied and validated, for a particular scenario. The scenario chosen is that of zero visibility high speed terrain following (V = 466 ft/sec, H = 200 ft) with an A-10 aircraft. The longitudal (linearized) dynamics are considered. The variations in (command path over) terrain pi(t) are modeled as a third order random process. The display design methodology is based on the optimal control model of pilot response, and employs this model in various ways in different phases of the design process. The overall methodology indicates that the design process is intended as a precursor to manned simulation. It provides a rank ordering of candidate displays through a three level process. S.L.

N82-13696*# Texas A&M Univ., College Station.
A DATA COLLECTION SCHEME FOR IDENTIFICATION OF PARAMETERS IN A DRIVER MODEL
B. W. Mooring, M. McDermott, and Je-Mang Su *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 333-343 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A high gain steering controller to compensate for limitations in a handicapped driver's range of motion is employed when adapting vehicle to his use. A driver/vehicle system can become unstable as vehicle speed is increased, therefore it is desirable to use a computer simulation of the driver/vehicle combination as a design tool to investigate the system response prior to construction of a controller and road testing. Unknown driver parameters must be identified prior to use of the model for system analysis. A means to collect the data necessary for identification of these driver model parameters without extensive instrumentation of a vehicle to measure and record vehicle states is addressed. Initial tests of the procedure identified all of the driver parameters with errors of 6% or less. S.L.

N82-13697*# Massachusetts Inst. of Tech., Cambridge. Man-Machine Lab.
TWO-D RESULTS ON HUMAN OPERATOR PERCEPTION
Alex A. Siapkara (Hellenic Technology Center, Athens) and Thomas B. Sheridan *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 345-359 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The application of multidimensional scaling methodology in human factors engineering is presented. The nonorthogonality of internally perceived task variables is exhibited for first and second order plants with both dependent and independent task variables. Directions of operator preference are shown for actual performance, pilot opinion rating, and subjective measures of fatigue, adaptability, and system recognition. Improvement of performance in second order systems is exhibited by the use of bang-bang feedback information. Dissimilarity measures for system comparison are suggested in order to account for human operator rotations and subjective sense of time. S.L.

N82-13698*# Illinois Univ. at Chicago Circle, Chicago. Coll. of Engineering.
COMPUTATIONAL PROBLEMS IN AUTOREGRESSIVE MOVING AVERAGE (ARMA) MODELS
Gyan C. Agarwal, Sherin M. Goodarzi, William D. ONeill, and Gerald L. Gottlieb *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 361-377 refs Prepared in cooperation with Rush Medical Center, Chicago (For primary document see N82-13665 04-54)
(Grants NSF ENG-76-08754; NS-12877)
Avail: NTIS HC A99/MF A01 CSCL 05H

The choice of the sampling interval and the selection of the order of the model in time series analysis are considered. Band limited (up to 15 Hz) random torque perturbations are applied to the human ankle joint. The applied torque input, the angular rotation output, and the electromyographic activity using surface electrodes from the extensor and flexor muscles of the ankle joint are recorded. Autoregressive moving average models are developed. A parameter constraining technique is applied to develop more reliable models. The asymptotic behavior of the system must be taken into account during parameter optimization to develop predictive models. S.L.

N82-13699*# ALPHATECH, Inc., Burlington, Mass.
MODELING HUMAN TRACKING ERROR IN SEVERAL DIFFERENT ANTI-TANK SYSTEMS
David L. Kleinman *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 379-392 refs Prepared in cooperation with Connecticut Univ., Storrs (For primary document see N82-13665 04-54)
(Contract DAAK11-80-C-0050)
Avail: NTIS HC A99/MF A01 CSCL 05H

An optimal control model for generating time histories of human tracking errors in antitank systems is outlined. Monte Carlo simulations of human operator responses for three Army antitank systems are compared. System/manipulator dependent data comparisons reflecting human operator limitations in perceiving displayed quantities and executing intended control motions are presented. Motor noise parameters are also discussed. M.D.K.

N82-13700*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
ON THE INTERNAL TARGET MODEL IN A TRACKING TASK
Alper K. Caglayan and Sheldon Baron *In* JPL Proc. of the 17th Conf. on Manual Control 15 Oct. 1981 p 393-397 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

An optimal control model for predicting operator's dynamic responses and errors in target tracking ability is summarized. The model, which predicts asymmetry in the tracking data, is dependent on target maneuvers and trajectories. Gunners perception, decision making, control, and estimate of target positions and velocity related to crossover intervals are discussed.

The model provides estimates for means, standard deviations, and variances for variables investigated and for operator estimates of future target positions and velocities. M.D.K.

N82-13701*# CAE Electronics Ltd., Montreal (Quebec).
MULTI-AXIS MANUAL CONTROLLERS: A STATE-OF-THE-ART REPORT
A. Lippay, G. M. McKinnon, and M. L. King *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 401-405 (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A literature search was carried out to examine the feasibility of a six degree of freedom hand controller. Factors addressed included related areas, approaches to manual control, applications of manual controllers, and selected studies of the human neuromuscular system. Results are presented. J.M.S.

N82-13702*# Messerschmidt-Boelkow G.m.b.H., Munich (West Germany).
THEORETICAL LINEAR APPROACH TO THE COMBINED MAN-MANIPULATOR SYSTEM IN MANUAL CONTROL OF AN AIRCRAFT
Klaus Brauser *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 407-418 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

An approach to the calculation of the dynamic characteristics of the combined man manipulator system in manual aircraft control was derived from a model of the neuromuscular system. This model combines the neuromuscular properties of man with the physical properties of the manipulator system which is introduced as pilot manipulator model into the manual aircraft control. The assumption of man as a quasilinear and time invariant control operator adapted to operating states, depending on the flight phases, of the control system gives rise to interesting solutions of the frequency domain transfer functions of both the man manipulator system and the closed loop pilot aircraft control system. It is shown that it is necessary to introduce the complete precision pilot manipulator model into the closed loop pilot aircraft transfer function in order to understand the well known handling quality criteria, and to derive these criteria directly from human operator properties. J.M.S.

N82-13703*# MRC Applied Psychology Unit, Cambridge (England).
THE INFLUENCE OF SHIP MOTION OF MANUAL CONTROL SKILLS
Peter McLeod, Christopher Poulton, Howard DuRoss (RAE, Farnborough, Engl.), and Wynn Lewis (WSL, Stevenage, Engl.) *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 419-430 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The effects of ship motion on a range of typical manual control skills were examined on the Warren Spring ship motion simulator driven in heave, pitch, and roll by signals taken from the frigate HMS Avenger at 13 m/s (25 knots) into a force 4 wind. The motion produced a vertical r.m.s. acceleration of 0.024g, mostly between 0.1 and 0.3 Hz, with comparatively little pitch or roll. A task involving unsupported arm movements was seriously affected by the motion; a pursuit tracking task showed a reliable decrement although it was still performed reasonably well (pressure and free moving tracking controls were affected equally by the motion); a digit keying task requiring ballistic hand movements was unaffected. There was no evidence that these effects were caused by sea sickness. The differing response to motion of the different tasks, from virtual destruction to no effect, suggests that a major benefit could come from an attempt to design the man/control interface onboard ship around motion resistant tasks. Author

N82-13704*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE ROLE OF MANIPULATOR CHARACTERISTICS IN SELECTING THE IDEAL EFFECTIVE VEHICLE
Ronald A. Hess *In* JPL Proc. of the 17th Ann. Conf. Manual Control 15 Oct. 1981 p 431-448 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A structural model of the human pilot is introduced and discussed. The model is used to provide a rationale for certain nonlinear pilot control behavior such as stick pulsing and serves as a framework for studying aspects of motor skill development. In light of the theoretical background provided by the model, some past empirical pilot response phenomena are analyzed and shown to be attributable to manipulator or control stick characteristics. In particular, some recent problems associated with pilot/vehicle performance in glideslope tracking in short takeoff and landing (STOL) aircraft are analyzed. The apparent contribution of the cockpit manipulator (throttle) characteristics to these problems are outlined and a solution proposed and evaluated in both simulation and flight test. J.M.S.

N82-13705*# General Dynamics/Pomona, Calif.
COMPUTER AIDED MANUAL TRACKING
Yung-Koh Yin and Russell F. Berg *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 449-454 ref (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A scheme was developed to assist the human operator by augmenting an optic sight manual tracking loop with target rate estimates from a computer control algorithm which can either be a Kalman Filter or an alpha, beta, gamma filter. The idea is for the computer to provide rate tracking while the human operator is responsible for nullifying the tracking error. A simple schematic is shown to illustrate the implementation of this concept. A hybrid real-time man-in-loop simulation was used to compare the tracking performance of the same flight trajectory with or without this form of computer-aided track. Preliminary results show the advantage of computer-aided track against high speed aircraft at close range. However, good tracking before target state estimator maturity becomes more critical for aided track than without. Results are presented for a constant velocity flight trajectory. J.M.S.

N82-13706*# CAE Electronics Ltd., Montreal (Quebec). Human Factors Engineering.
DESIGN AND DEVELOPMENT OF A SIX DEGREE OF FREEDOM HAND CONTROLLER
M. L. King, G. M. McKinnon, and A. Lippay *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 455-463 (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The design objectives of a six degree of freedom manual controller are discussed with emphasis on a space environment. Details covered include problems associated with a zero-g environment, the need to accommodate both 'shirt sleeve' and space suited astronauts, the combination of both manipulator operation and spacecraft flight control in a single device, and to accommodate restraints in space. A variable configuration device designed as a development tool in which rotational axes can be moved relative to one another, is described and its limitations discussed. Two additional devices were developed for concept testing. Each device combines the need for good quality with its ability achieve a wide range of adjustments. J.M.S.

N82-13707*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EXPERIMENTAL RESULTS WITH A SIX-DEGREE-OF-FREEDOM FORCE-REFLECTING HAND CONTROLLER
A. K. Bejczy and M. Handlykken (Technical Univ. of Norway, Trondheim) *In its* Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 465-477 refs (For primary document see N82-13665 04-54)
(Contract NAS7-100)
Avail: NTIS HC A99/MF A01 CSCL 05H

Control experiments performed using an isotonic joystick connected to a six degree-of-freedom manipulator equipped with a six dimensional force-torque sensor at the base of the manipulator end effector are described. The preliminary control experiments were aimed at the investigation of the human operators' ability to command and control forces in different directions by varying the information conditions and the values of the feedforward and feedback command gains in the bilateral control loop. The main conclusions are: (1) a quantified graphic display of force-torque information can considerably enhance

the operator's ability to perform a quantitatively sharp force-torque control, and (2) there seems to be a task dependent optimal combination of the feedforward and feedback command gain values which provide a dynamically smooth and stable bilateral control performance. J.M.S.

N82-13708*# Illinois Univ. at Chicago Circle, Chicago. Bioengineering Program.

LOAD COMPENSATING REACTIONS TO PERTURBATIONS AT WRIST JOINT IN NORMAL MAN

R. J. Jaeger, G. C. Agarwell, and G. L. Gottlieb *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 479-501 refs Prepared jointly with Rush Medical Coll. (For primary document see N82-13665 04-54)

(Grants NSF ENG-76-08754; NIH-NS-00196; NIH-NS-12877)

Avail: NTIS HC A99/MF A01 CSCL 05H

The electromyographic responses to step torque loads were studied in flexors and extensors at the human wrist. Based on temporal bursting patterns and functional behavior, the response was divided into four temporal components. Two early components, the myotatic (30-60 ms) late myotatic (60-120 ms) appears to be reflex response. The third postmyotatic component (120-200 ms) appear to be a triggered reaction, preceeding the fourth, stabilizing component (200-400 ms). A comparison of response at the wrist with similar data at the ankle provides the basis for a generalized classification of the response in various muscles to torque step perturbations. Author

N82-13709*# Southern California Research Inst., Los Angeles.

MANUAL CONTROL ANALYSIS OF DRUG EFFECTS ON DRIVING PERFORMANCE

Alison Smiley, Kenneth Ziedman, and Herbert Moskowitz *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 503-514 refs (For primary document see N82-13665 04-54)

(Contract NIDA-271-76-3316)

Avail: NTIS HC A99/MF A01 CSCL 05H

The effects of secobarbital, diazepam, alcohol, and marihuana on car-driver transfer functions obtained using a driving simulator were studied. The first three substances, all CNS depressants, reduced gain, crossover frequency, and coherence which resulted in poorer tracking performance. Marihuana also impaired tracking performance but the only effect on the transfer function parameters was to reduce coherence. Author

N82-13710*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PILOT SCANNING PATTERNS WHILE VIEWING COCKPIT DISPLAYS OF TRAFFIC INFORMATION

Stephen R. Ellis and Lawrence Stark *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 517-524 refs Prepared jointly with California Univ., Berkeley (For primary document see N82-13665 04-54)

Avail: NTIS HC A99/MF A01 CSCL 05H

Scanning eye movements of airline pilots were recorded while they judged air traffic situations displayed on cockpit displays of traffic information (CDTI). The observed 1st order transition patterns between points of interest on the display showed reliable deviation from those patterns predicted by the assumption of statistical independence. However, both patterns of transitions correlated quite well with each other. Accordingly, the assumption of independence provided a surprisingly good model of the results. Nevertheless, the deviation between the observed patterns of transition and that based on the assumption of independence was for all subjects in the direction of increased determinism. Thus, the results provide objective evidence consistent with the existence of 'scanpaths' in the data. Author

N82-13711*# California Univ., Berkeley.

PUPILLOMETRY, A BIOENGINEERING OVERVIEW

G. Myers, J. Anchetta, B. Hannaford, P. Peng, K. Sherman, L. Stark, F. Sun, and S. Usui *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 525-536 refs Sponsored by NIH (For primary document see N82-13665 04-54)

(Contract NCC2-86)

Avail: NTIS HC A99/MF A01 CSCL 05H

The pupillary control system is examined using a microprocessor based integrative pupillometer. The real time software functions of the microprocessor include: data collection, stimulus generation and area to diameter conversion. Results of an analysis of linear and nonlinear phenomena are presented. J.M.S.

N82-13712*# California Univ., Berkeley.

MODEL SIMULATION STUDIES TO CLARIFY THE EFFECT ON SACCADIC EYE MOVEMENTS OF INITIAL CONDITION VELOCITIES SET BY THE VESTIBULAR OCULAR REFLEX (VOR)

Moon-Hyon Nam, Jack M. Winters, and Lawrence Stark *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 537-548 refs Sponsored by the Korean Ministry of Education (For primary document see N82-13665 04-54)

(Contract NCC2-86)

Avail: NTIS HC A99/MF A01 CSCL 05H

Voluntary active head rotations produced vestibulo-ocular reflex eye movements (VOR) with the subject viewing a fixation target. When this target jumped, the size of the refixation saccades were a function of the ongoing initial velocity of the eye. Saccades made against the VOR were larger in magnitude. Simulation of a reciprocally innervated model eye movement provided results comparable to the experimental data. Most of the experimental effect appeared to be due to linear summation for saccades of 5 and 10 degree magnitude. For small saccades of 2.5 degrees, peripheral nonlinear interaction of state variables in the neuromuscular plant also played a role as proven by comparable behavior in the simulated model with known controller signals. Author

N82-13713*# California Univ., Berkeley.

BENEFITS OF DETAILED MODELS OF MUSCLE ACTIVATION AND MECHANICS

Steven L. Lehman and Lawrence Stark *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 546-556 refs (For primary document see N82-13665 04-54)

Avail: NTIS HC A99/MF A01 CSCL 05H

Recent biophysical and physiological studies identified some of the detailed mechanisms involved in excitation-contraction coupling, muscle contraction, and deactivation. Mathematical models incorporating these mechanisms allow independent estimates of key parameters, direct interplay between basic muscle research and the study of motor control, and realistic model behaviors, some of which are not accessible to previous, simpler, models. The existence of previously unmodeled behaviors has important implications for strategies of motor control and identification of neural signals. New developments in the analysis of differential equations make the more detailed models feasible for simulation in realistic experimental situations. Author

N82-13714*# National Aerospace Lab., Amsterdam (Netherlands).

A MODEL OF THE HUMAN OBSERVER AND DECISION MAKER

P. H. Wewerinke *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 557-570 refs (For primary document see N82-13665 04-54)

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The decision process is described in terms of classical sequential decision theory by considering the hypothesis that an abnormal condition has occurred by means of a generalized likelihood ratio test. For this, a sufficient statistic is provided by the innovation sequence which is the result of the perception an information processing submodel of the human observer. On the basis of only two model parameters, the model predicts the decision speed/accuracy trade-off and various attentional characteristics. A preliminary test of the model for single variable failure detection tasks resulted in a very good fit of the experimental data. In a formal validation program, a variety of multivariable failure detection tasks was investigated and the predictive capability of the model was demonstrated. A.R.H.

N82-13715*# Lockheed Electronics Co., Plainfield, N. J.

HUMAN SUPERVISION AND MICROPROCESSOR CONTROL OF AN OPTICAL TRACKING SYSTEM

William J. Bigley and John D. Vandenberg *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 571-582 refs (For primary document see N82-13665 04-54)

Avail: NTIS HC A99/MF A01 CSCL 05H

Gunners using small calibre anti-aircraft systems have not

been able to track high-speed air targets effectively. Substantial improvement in the accuracy of surface fire against attacking aircraft has been realized through the design of a director-type weapon control system. This system concept frees the gunner to exercise a supervisory/monitoring role while the computer takes over continuous target tracking. This change capitalizes on a key consideration of human factors engineering while increasing system accuracy. The advanced system design, which uses distributed microprocessor control, is discussed at the block diagram level and is contrasted with the previous implementation. Author

N82-13716*# Systems Technology, Inc., Hawthorne, Calif.
A THEORY OF HUMAN ERROR
Duane T. McRuer, Warren F. Clement, and R. Wade Allen *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 583-594 refs (For primary document see N82-13665 04-54)
(Contract NAS2-10400)
Avail: NTIS HC A99/MF A01 CSCL 05H

Human errors tend to be treated in terms of clinical and anecdotal descriptions, from which remedial measures are difficult to derive. Correction of the sources of human error requires an attempt to reconstruct underlying and contributing causes of error from the circumstantial causes cited in official investigative reports. A comprehensive analytical theory of the cause-effect relationships governing propagation of human error is indispensable to a reconstruction of the underlying and contributing causes. A validated analytical theory of the input-output behavior of human operators involving manual control, communication, supervisory, and monitoring tasks which are relevant to aviation, maritime, automotive, and process control operations is highlighted. This theory of behavior, both appropriate and inappropriate, provides an insightful basis for investigating, classifying, and quantifying the needed cause-effect relationships governing propagation of human error. A.R.H.

N82-13717*# Systems Technology, Inc., Hawthorne, Calif.
STABILITY ANALYSIS OF AUTOMOBILE DRIVER STEERING CONTROL
R. Wade Allen *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 597-609 refs Sponsored in part by the Ford Motor Co. (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

In steering an automobile, the driver must basically control the direction of the car's trajectory (heading angle) and the lateral deviation of the car relative to a delineated pathway. A previously published linear control model of driver steering behavior which is analyzed from a stability point of view is considered. A simple approximate expression for a stability parameter, phase margin, is derived in terms of various driver and vehicle control parameters, and boundaries for stability are discussed. A field test study is reviewed that includes the measurement of driver steering control parameters. Phase margins derived for a range of vehicle characteristics are found to be generally consistent with known adaptive properties of the human operator. The implications of these results are discussed in terms of driver adaptive behavior. Author

N82-13718*# Systems Technology, Inc., Hawthorne, Calif.
DETECTING HUMAN OPERATOR IMPAIRMENT WITH A PSYCHOMOTOR TASK
R. Wade Allen, Anthony C. Stein, and Henry R. Jex *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 611-625 refs (For primary document see N82-13665 04-54)
(Contract DOT-HS-8-02052)
Avail: NTIS HC A99/MF A01 CSCL 05H

Psychomotor tasks have long been used as instruments for measuring human operator behavior and have often been proposed as selection and training devices. The application of the 'Critical-instability Tracking Test' (CTT) in the detection of alcohol impaired human operators is discussed. The detection problem wherein statistical decision theory is used to optimize the test's ability to discriminate impaired operators in the face of inherent variability in human performance is considered. Testing strategy is examined including setting performance criteria levels and determining the number of attempts permitted in order to pass the test. Also, the task's ability to detect operator impairment is compared to performance measures obtained in a driving simulator. A.R.H.

N82-13719*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VOICE CONTROL OF THE SPACE SHUTTLE VIDEO SYSTEM
A. K. Bejczy, R. S. Dotson, J. W. Brown, and J. L. Lewis *In its* Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 627-640 Prepared in cooperation with NASA, Johnson Space Center (For primary document see N82-13665 04-54)
(Contract NAS7-100)
Avail: NTIS HC A99/MF A01 CSCL 05H

A pilot voice control system developed at the Jet Propulsion Laboratory (JPL) to test and evaluate the feasibility of controlling the shuttle TV cameras and monitors by voice commands utilizes a commercially available discrete word speech recognizer which can be trained to the individual utterances of each operator. Successful ground tests were conducted using a simulated full-scale space shuttle manipulator. The test configuration involved the berthing, maneuvering and deploying a simulated science payload in the shuttle bay. The handling task typically required 15 to 20 minutes and 60 to 80 commands to 4 TV cameras and 2 TV monitors. The best test runs show 96 to 100 percent voice recognition accuracy. A.R.H.

N82-13720*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
A COMPARISON OF HEAD AND MANUAL CONTROL FOR A POSITION-CONTROL PURSUIT TRACKING TASK
William H. Levison, Greg L. Zacharias, James L. Porterfield, Donald Monk, and Christopher Arbak *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 641-652 refs Prepared jointly with Aerospace Medical Div., Aerospace Medical Research Labs. (6570th) (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

Head control was compared with manual control in a pursuit tracking task involving proportional controlled-element dynamics. An integrated control/display system was used to explore tracking effectiveness in horizontal and vertical axes tracked singly and concurrently. Compared with manual tracking, head tracking resulted in a 50 percent greater rms error score, lower pilot gain, greater high-frequency phase lag and greater low-frequency remnant. These differences were statistically significant, but differences between horizontal- and vertical-axis tracking and between 1- and 2-axis tracking were generally small and not highly significant. Manual tracking results were matched with the optimal control model using pilot-related parameters typical of those found in previous manual control studies. Head tracking performance was predicted with good accuracy using the manual tracking model plus a model for head/neck response dynamics obtained from the literature. Author

N82-13721*# Tufts Univ., Medford, Mass. Dept. of Engineering Design.
INTERRUPTION AS A TEST OF THE USER-COMPUTER INTERFACE
John G. Kreifeldt and Mary E. McCarthy *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 655-667 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

In order to study the effects different logic systems might have on interrupted operation, an algebraic calculator and a reverse polish notation calculator were compared when trained users were interrupted during problem entry. The RPN calculator showed markedly superior resistance to interruption effects compared to the AN calculator although no significant differences were found when the users were not interrupted. Causes and possible remedies for interruption effects are speculated. It is proposed that because interruption is such a common occurrence, it be incorporated into comparative evaluation tests of different logic system and control/display system and that interruption resistance be adopted as a specific design criteria for such design. A.R.H.

N82-13722*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A MODEL FOR THE CONTROL MODE MAN-COMPUTER

INTERFACE DIALOGUE
Roy L. Chafin *In its* Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 669-682 refs (For primary document see N82-13665 04-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A four stage model is presented for the control mode man-computer interface dialogue. It consists of context development, semantic development syntactic development, and command execution. Each stage is discussed in terms of the operator skill levels (naive, novice, competent, and expert) and pertinent human factors issues. These issues are human problem solving, human memory, and schemata. The execution stage is discussed in terms of the operators typing skills. This model provides an understanding of the human process in command mode activity for computer systems and a foundation for relating system characteristics to operator characteristics. Author

N82-13723*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
STRUCTURE OF THE KNOWLEDGE BASE FOR AN EXPERT LABELING SYSTEM
N. S. Rajaram *In* JPL Proc. of the 17th Ann. Conf. on Manual Control 15 Oct. 1981 p 683-688 refs (For primary document see N82-13665 04-54)
(Contract NAS9-15800)
Avail: NTIS HC A99/MF A01 CSCL 05H

One of the principal objectives of the NASA AgRISTARS program is the inventory of global crop resources using remotely sensed data gathered by Land Satellites (LANDSAT). A central problem in any such crop inventory procedure is the interpretation of LANDSAT images and identification of parts of each image which are covered by a particular crop of interest. This task of labeling is largely a manual one done by trained human analysts and consequently presents obstacles to the development of totally automated crop inventory systems. However, development in knowledge engineering as well as widespread availability of inexpensive hardware and software for artificial intelligence work offers possibilities for developing expert systems for labeling of crops. Such a knowledge based approach to labeling is presented. Author

N82-13724# Anthropology Research Project, Yellow Springs, Ohio.
ANTHROPOMETRIC SIZING SYSTEMS FOR ARMY WOMEN'S FIELD CLOTHING
Kathleen Robinette, Thomas Churchill, and John T. McConville Natick, Mass. Army Research and Development Lab. Mar. 1981 231 p
(Contract DAAK60-79-C-0097)
(AD-A102104; NATICK-TR-81/026; CEMEL-233) Avail: NTIS HC A11/MF A01 CSCL 05/1

A series of anthropometricaly based sizing programs and tariffs for Army women's field clothing are reported are size systems for upper body, lower body and total body garments are included. Sizing tables on which recommended values for some 59 dimensions relevant to garment construction are highlighted for easy identification are presented. Regression equations, rather than more traditional methods, were used to develop the sizing data and supportive material to permit designers to modify suggested dimensional values or to compute alternative sizing programs. A visual index accompanied by measurement descriptions, and bivariate distribution tables on which size categories have been graphically superimposed serve as visual references for users. Author

N82-13725# Air Force Human Resources Lab., Brooks AFB, Tex. Manpower and Personnel Div.
WEIGHTING OF APTITUDE COMPONENTS BASED ON DIFFERENCES IN TECHNICAL SCHOOL DIFFICULTY
Interim Report, 1 Jun. 1980 - 1 Apr. 1981
C. J. Mullins, James A. Earles, and Malcolm Ree Jul. 1981 20 p refs
(AD-A102045; AFHRL-TR-81-19) Avail: NTIS HC A02/MF A01 CSCL 05/9

A method of adjusting technical school grades issued by schools of varying difficulty so that a new criterion is formed with all school grades adusted to the same metric was evaluated. This new criterion was used to recompute aptitude indexes which were compared with aptitude indexes computed in the conventional manner. It is found that the new aptitude indexes predict school grades in a cross validation sample better than the conventional aptitude indexes. Author

N82-13726# Carl-Cranz-Gesellschaft e.V., Brunswick (West Germany). Lehrgangsreihe Flugtechnik.
TAXONOMY OF THE HUMAN FACTORS IN MAN MACHINE SYSTEMS [TAXONOMIE DER HUMANFAKTOREN IN MENSCH-MASCHINE-SYSTEMEN]
K. Steininger (DFVLR, Hamburg) 1980 30 p refs In GERMAN
Avail: NTIS HC A03/MF A01

The human factors in man-machine systems are presented in a global model showing the manifold interplay between man, technical system and management. The psychic and social constraints involved are stressed. The nature of human error is also treated by means of a classification and the relation between work load and perceived stress is discussed. On the basis of these classifications, ergonometric methods and concepts for human factor engineering are derived and proposed for further investigations are formulated. Author (ESA)

N82-13058# Naval Air Development Center, Warminster, Pa.
THE INTELLIGENT USE OF INTELLIGENT SYSTEMS: PROBLEMS IN ENGINEERING MAN/MACHINE SYMBIOSIS
J. Hopson, W. Zachary (Analytics, Inc., Willow Grove, Pa.), and N. Lane *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 16 p refs (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

N82-13062# Naval Air Test Center, Patuxent River, Md.
EVALUATION OF A PILOT WORKLOAD ASSESSMENT DEVICE TO TEST ALTERNATE DISPLAY FORMATS AND CONTROL HANDLING QUALITIES
Samuel G. Schiflett, Paul M. Linton (Naval Air Development Center, Warminster, Pa.), and Ronald J. Spicuzza (Systems Research Labs., Inc., Dayton, Ohio) *In* AGARD The Impact of New Guidance and Control Systems on Mil. Aircraft Cockpit Design Aug. 1981 12 p refs (For primary document see N82-13048 04-01)
Avail: NTIS HC A10/MF A01

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N82-13727# Army Research Office, Research Triangle Park, N. C.
PROCEEDINGS OF THE 1981 ARMY NUMERICAL ANALYSIS AND COMPUTERS CONFERENCE
Aug. 1981 632 p refs Conf. held at Redstone Arsenal, Alabama, 26-27 Feb. 1981
(AD-A103175; ARO-81-3) Avail: NTIS HC A99/MF A01 CSCL 12/1

These proceedings preserve in print most of the invited addresses and contributed papers of the 1981 Army Numerical Analysis and Computers Conference. The theme of this year's conference was Mathematical Software. Not only did the invited speakers treat this important area but many of the contributed

papers emphasized it. Preceding the conference a tutorial on Software Reliability was offered. Another special event was an evening session on the UNIX Operating System for certain computers manufactured by the Digital Equipment Corporation.
L.F.M.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N82-13728 Purdue Univ., Lafayette, Ind.
AN ANALYTICAL STUDY OF MULTIPROCESSOR SYSTEM RELIABILITY Ph.D. Thesis
Tian-Pong Chang 1981 200 p
Avail: Univ. Microfilms Order No. 8123620

The reliability performance of multiprocessor architectures is studied. A formal probabilistic graph is proposed to model multiprocessor systems. The Multi-partite graph is used to model multiprocessor architectures. Three categories of multiprocessor systems are considered according to their interconnection structures, (i.e., configurations with crossbar switch, time shared busses, and multiport memories). The multiprocessing performance level is defined by the resources demanding threshold. Combinatorial enumeration techniques are used to find the reliability expressions. Closed formulations are obtained to evaluate the system reliability/availability of all three multiprocessor architectures at different performance levels. The reliability sensitivity of various multiprocessor systems are studied to determine the most critical components in a given system. Two optimization techniques were developed to maximize the system reliability under a given cost constraint. Dissert. Abstr.

N82-13729 Ohio State Univ., Cleveland.
SYSTEM DESIGN OF THE DISTRIBUTED LOOP DATA BASE SYSTEM (BLDBS) Ph.D. Thesis
Chuen-Pu J. Chou 1981 313 p
Avail: Univ. Microfilms Order No. 8121774

The distributed double loop computer network (DDLCN) is designed as a fault tolerant distributed processing system that interconnects midi, mini, and micro computers using a double loop structure. It serves as a means of investigating fundamental problems in distributed processing and local networking. One of the major distributed services provided by DDLCN is a distributed data base system. In the distributed data base system, the user has logically integrated access to a collection of data which is managed on a network of geographically dispersed computers. Users' requests to the data base can be satisfied independently of the physical location of the data base, data base definitions, and the data base management system (DBMS). A method for designing such a distributed data base system for distributed processing systems in general and for DDLCN in particular is presented. Dissert. Abstr.

N82-13730 Northwestern Univ., Evanston, Ill.
AN INTEGRATED APPROACH FOR THE SPECIFICATION AND THE DESIGN OF THE CONCEPTUAL LEVEL IN DATABASE SYSTEMS Ph.D. Thesis
Sabah Saleh Al-Fedaghi 1981 257 p
Avail: Univ. Microfilms Order No. 8124838

A unifying conceptual model called the (k) model and a systematic design methodology called the intersection methodology are described. The (k) model is built on a type of recursive graph called the high order graph. The basic characteristics of the (k) graph are studied and their potential use for the modelling of large scale systems is presented. The (k) model is proposed as an integrated 'knowledge' repository of the enterprise, and at the same time, as a mapping tool for associating conceptual elements with those at the internal level. The (k) graph, the definitional formulae, the conceptual mappings and the intersection methodology are utilized to build a canonical representation of the conceptual level of database systems. Each element in the (k) graph is considered as a module (i.e. declarative/ procedural unit). A nucleus of a language for the specification of these modules is presented. Dissert. Abstr.

N82-13731 Northwestern Univ., Evanston, Ill.
AN APPROACH FOR NUMERICAL DATABASE MANAGEMENT Ph.D. Thesis
Ola-Olu Adeniyi Daini 1981 205 p
Avail: Univ. Microfilms Order No. 8124870

An approach for a numerical database manaagement system (NDBMS) that would promote physical data independence by relieving users from the need for knowledge of the physical data organization on the secondary devices is described. The approach is to describe each of the storage techniques by a physical scheme, which encompasses the corresponding access path, the encoding to storage structures, and the file access method. The numerical physical schemes are classified into three encoding groups which are discriminated according to the access path into direct, indirect and linked schemes. A generalized facility for describing any kink of numerical database and its mapping to storage is provided via nonprocedural Stored Data Description and Mapping Languages (SDDL and SDML). A Data Manipulator Language (DML) provides an interface between the application users and the NDBMS via a set of higher level commands embedded in FORTRAN. The feasibility of the generalized approach is shown by a prototype implementation of a translation program. Dissert. Abstr.

N82-13732 Stanford Univ., Calif.
INFORMATION STORAGE IN A DECENTRALIZED COMPUTER SYSTEM Ph.D. Thesis
David Kenneth Gifford 1981 143 p
Avail: Univ. Microfilms Order No. 8124072

An architecture for shared information storage in a decentralized computer system is described. Naming of files and other objects (naming), reliable storage of data (stable storage), coordinated access to shared storage (transactional storage), location of objects (location), use of multiple copies to increase performance, reliability and availability (replication), dynamic modification of object representations (reconfiguration), and storage security and authentication (protection) are addressed. A complete model of the architecture is presented, which describes the interface to the facilities provided, and the mechanisms for implementing them. Dissert. Abstr.

N82-13733# Ford Aerospace and Communications Corp., Sunnyvale, Calif. Engineering Services Div.
AN INFORMATION PROCESSING MODEL FOR PREDICTING ERROR DETECTION AND CORRECTION: AN ANALYSIS OF OPERATOR PERFORMANCE Final Report, Jun. 1979 - May 1981
Robert A. Goldbeck and Felice M. Ferrante Jul. 1981 73 p refs
(Contract F47620-79-C-0147)
(AD-A105079; ESD-SCFO-TR-6210; AFOSR-81-0681TR) Avail: NTIS HC A04/MF A01 CSCL 05/9

The overall objective of this research was to develop the capability to predict operator performance at a system console. To be useful in industry, this prediction should be available prior to production of a prototype or simulator. The value of such predictions is the opportunity for an analyst to select a design that meets system performance requirements while optimizing human performance, and to be able to make this selection before hardware and software design and development activities commence. For this study, three models were examined to determine how each could contribute to the formulation of an integrated model for predicting human performance. GRA

N82-13734# Minnesota Univ., Minneapolis. Dept. of Computer Science.
PREEMPTIVE SCHEDULING OF A MULTIPROCESSOR SYSTEM WITH MEMORIES TO MINIMIZE L SUB MAX
Ten Hwang Lai and Sartaj Sahni Jun. 1981 36 p refs
(Contract N00014-80-C-0650; Grant NSF MCS-80-005856)
(AD-A103795; TR-81-20) Avail: NTIS HC A03/MF A01 CSCL 09/2

An O(k square n + nlogn) algorithm is developed to obtain a preemptive schedule that minimizes Lmax when n jobs with given memory requirements are to be scheduled on m proces-

sors of given memory sizes and k is the number of distinct due dates. The value of the minimum Lmax can itself be found in O(kn + nlogn) time. Author

N82-13735# Purdue Univ., Lafayette, Ind. Dept. of Computer Science.
INTRODUCTION TO THE CONFIGURABLE HIGHLY PARALLEL COMPUTER, REVISION Interim Technical Report
Lawrence Snyder 18 May 1981 35 p refs
(Contracts N00014-80-K-0816; N00014-81-K-0360)
(AD-A099776; CSD-TR-351) Avail: NTIS HC A03/MF A01 CSCL 09/2

The Configurable highly parallel (CHip) computer family was introduced. Architectures are built around a lattice of programmable switches and data paths that permit processing elements to be connected in arbitrary patterns. The approach preserves locality. The parameters that determine various family members and switch configuration storage capacity, switch and processor element degrees and corridor width are discussed. An efficient embedding of a complete binary tree in presented to illustrate interconnection pattern programming. An algorithm for solving a system of linear equations is given. Author

N82-13736# Michigan State Univ., East Lansing. Dept. of Chemistry.
BEYOND MERE AUTOMATION Interim Technical Report
Christie G. Enke 1 Sep. 1981 15 p refs
(Contract N00014-76-C-1092)
(AD-A103838; TR-6) Avail: NTIS HC A02/MF A01 CSCL 09/2

The impact of the microprocessor on intelligent chemical instrumentation is addressed. Fundamentals of microprocessor control systems are ellucidated. The software problem is included. Examples of laboratory equipment are discussed, including the intelligent management of a linear diode array detector, a multiple microprocessor system for simultaneous execution of related tasks in a triple quadrupole mass spectrometer, a hierarchical system of minicomputers, and single and multiple microcomputers. Microprocessor capabilities are presented, including multiple variable processing, adaptation to a large variety of transducers, control of high speed operations, and complex data interpretation. The effect of microprocessor technology on chemical instrumentation is forecast, not only in automation and intelligent control, but also in design concepts and enhanced measuring capabilities. Some likely directions for future development are explored. Author

N82-13737# Naval Ocean Systems Center, San Diego, Calif. Sensor Processing and Analysis Div.
DIGITAL DATA COMPRESSION ALGORITHM PERFORMANCE COMPARISIONS: PROPOSED NATO STANDARD ALGORITHM PROVIDES BETTER FACSIMILE IN A NOISY COMMUNICATIONS ENVIRONMENT THAN PRESENT TACTICAL DIGITAL FACSIMILE ALGORITHM
C. E. Winterbauer 30 Apr. 1981 68 p
(AD-A103159; NOSC/TR-686) Avail: NTIS HC A04/MF A01 CSCL 09/2

Performance of the NATO data compression algorithm in a noisy communication channel is superior to that of the present TDF data compression algorithm, provided that the noise channel is not too harsh. Text is legible in a noise channel that has a bite error probability on the order 1 x 1/10 cubed (single bit errors). Multiple (burst) error are not a problem provided the burst length does not exceed ten bits. Where actual burst length greatly exceeds ten-bit (maximum) average expected in tactical situation noise, data compression algorithm performance may be poor, as with most data compression algorithm without a poweful noise protection algorthm. The NATO algorithm has enough compression to meet current TDF performance specification, but its compression efficiency is lower than that of the TDF. The two algorithms have about the same complexity. Author

N82-13738# Maryland Univ., College Park. Dept. of Computer Science.
ON THE FORMAL SPECIFICATION OF COMPUTER COMMUNICATION PROTOCOLS
Kenneth F. Shotting Dec. 1980 101 p refs
(Grant AF-AFOSR-3654-78)
(AD-A100189; TR-973; AFOSR-81-0491TR) Avail: NTIS HC A06/MF A01 CSCL 09/2

A framework to specify and verify communications protocols is presented. It views a communication system as a hierarchy of abstract machines using the hierarchical development methodology. A framework for formally specifying protocols, the formal specification of a particular protocol and an evaluation of the applicability of HDM to protocol specifications is discussed. A specification of the internet protocol developed as a sample use of the methods is included. Author

N82-13739# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.
DISTRIBUTED AND DECENTRALIZED CONTROL IN FULLY DISTRIBUTED PROCESSING SYSTEMS Final Technical Report, 15 Jan. - 30 Sep. 1980
Philip H. Enslow, Jr. and Timothy G. Saponas Jun. 1981 116 p refs
(Contract F30602-78-C-0120)
(AD-A104379; GIT-ICS-81/02; RADC-TR-81-127) Avail: NTIS HC A06/MF A01 CSCL 09B

Problems regarding the design and implementation of distributed and decentralized control are examined with particular reference to parallel processing. The general philosophies of control for the 'fully' distributed system are then presented along with the notation developed to describe the control actions of such processing activities. M.G.

N82-13740# Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
DYNAMIC DECISION-MAKING IN MULTI-TASK ENVIRONMENTS: THEORY AND EXPERIMENTAL RESULTS Final Scientific Report, 1 Oct. 1978 - 15 Jan. 1981
Krishna R. Pattipati and David L. Kleinman 15 Mar. 1981 129 p refs
(Grant AF-AFOSR-3733-78)
(AD-A102055; AFOSR-81-0586TR; EECS-TR-81-9) Avail: NTIS HC A07/MF A01 CSCL 09/2

Human monitoring, information processing, and task selection procedures in dynamic multitask environments, as a preliminary step towards analyzing and evaluating the human component of a supervisory control system is studied. A computer representation of the supervisory decision situation is developed. The human is presented with a dynamic situation wherein tasks of different value, time requirement and deadline compete for his attention. The effects of various task related variables on the human decision processes are studied. A normative dynamic decision model (DDM) of human task sequencing performance is developed. The analytic framework of the DDM is based on modern control, estimation and semi-Markov decision process theories, which provide a general methodology for analyzing dynamic decision making under uncertainty. Several time, history, and scalar measures of performance are proposed in order to validate the model. Excellent model data agreement is obtained for all the experimental conditions studied. GRA

N82-13741# Naval Ship Research and Development Center, Bethesda, Md. Computation, Mathematics and Logistics Dept.
PLAYBK-ROUTINES TO DRIVE A DIGITAL-TO-ANALOG CONVERTER
James R. Carlberg Jan. 1981 14 p
(SR0140301)
(AD-A102049; DTNSRDC/CMLD-81/02) Avail: NTIS HC A02/MF A01 CSCL 09/2

Two software drivers were written to control a digital-to-analog (D/A) converter on a PDP-11/45 minicomputer. One driver is a stand-alone program which outputs user specified data to the D/A converter at a user specified rate and scale factor. The second driver is a FORTRAN callable controller where the calling program specifies the data buffer, rate, and sale factor. This report is a user's document describing the procedure for using the controllers. Author

N82-13742# Georgia Inst. of Tech., Atlanta. Information and Computer Science.
A DIFFERENCE IN EFFICIENCY BETWEEN SYNCHRONOUS

AND ASYNCHRONOUS SYSTEMS
Eshrat Arjomandi (York Univ., Ontario), Michael J. Fischer (Washington Univ., Seattle), and Nancy A. Lynch Jun. 1981 8 p refs
(Contracts DAAG29-79-C-0155; N00014-79-C-0873; N00014-80-C-0221; Grants NSF MCS-77-15628; NSF MCS-79-24370)
(AD-A102280; GIT-ICS-81/07; ARO-16451.6-EL) Avail: NTIS HC A02/MF A01 CSCL 09/2

A system of parallel processes is said to be synchronous if all processes run using the same clock, and it is asynchronous if each process has its own independent clock. For any s, n, a particular distributed problem is defined involving system behavior at n 'ports'. This problem can be solved in time s by a synchronous system but requires time at least (s-l) log n on any asynchronous system. Author

N82-13743# Los Alamos Scientific Lab., N. Mex.
APPLICATION OF COMPUTER VOICE INPUT/OUTPUT
W. Ford and D. G. Shirk 1981 7 p refs Presented at the 22nd Ann. Meeting of the Inst. of Nucl. Mater. Management, San Francisco, 13-15 Jul. 1981
(Contract W-7405-eng-36)
(DE81-028769; LA-UR-81-2052; CONF-810706-27) Avail: NTIS HC A02/MF A01

Two simple voice controlled systems were designed for nuclear safeguards applications. Each can easily be expanded as time allows. The first system is for instrument control that accepts voice commands and issues audible operator prompts. The second system is for access control. The speaker's voice is used to verify his identity and to actuate external devices. DOE

N82-13744# National Bureau of Standards, Washington, D.C.
COMPUTER SCIENCE AND TECHNOLOGY: NBS PROGRAMMING ENVIRONMENT WORKSHOP REPORT Final Report
Martha A. Branstad, ed. and W. Richards Adrion, ed. Jun. 1981 111 p refs
(PB81-237869; NBS-SP-500-78; LC-81-600068) Avail: NTIS HC A06/MF A01 CSCL 09B

In May of 1980, NBS hosted a workshop to assess the state-of-the-art in programming environment technology and to determine the key questions and issues that must be addressed to use these techniques to improve software quality and productivity within the Federal Government. The results of the workshop are presented. GRA

N82-13745# Federal Compiler Testing Center, Washington, D.C.
DIGITAL EQUIPMENT CORPORATION VAX-11 FORTRAN, VERSION 2 Validation Summary Report
21 Jul. 1981 13 p
(PB81-232431; FCVS78-VSR806) Avail: NTIS HC A02/MF A01 CSCL 09B

The Validation Summary Report (VSR) for the DEC VAX-11 FORTRAN Compiler Version 2 (VAX/VMS Version 2) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978). The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies; a section relating the categories of discrepancies to the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

N82-13746# Federal Compiler Testing Center, Washington, D.C.
DIGITAL EQUATION CORPORATION PDP-11 COBOL, VERSION 4.1 Validation Summary Report
21 Jul. 1981 50 p
(PB81-232423; CCVS74-VSR805) Avail: NTIS HC A03/MF A01 CSCL 09B

The Validation Summary Report (VSR) for the DEC PDP-11 COBOL Compilar Version 4.1 (RSX-11M+ Version 1.0) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language; and a detailed listing o discrepancies together with the tests which were failed. GRA

N82-13747# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
DIGITAL EQUIPMENT CORPORATION, PDP-11 COBOL VERSION, 4.1 INDEXED 1-0 MODULE
21 Jul. 1981 11 p
(PB81-232415; FCTC/TR-81/21) Avail: NTIS HC A02/MF A01 CSCL 09B

The FCTC Technical Report for the indexed I-O Module of the DEC PDP-11 COBOL Compiler Version 4.1 (RSX-11M+ Version 1.0) provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O Module of the 1974 COBOL Standard (x3.23-1974/FIPS PUB 21-1). This Technical Report is made up of several sections showing the discrepancies found. A companion report (Validation Summary Report CCVS74-VRSR805) provides information regarding the validation of the Compiler at the low Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N82-13748*# Federal Compiler Testing Center, Falls Church, Va.
SPERRY UNIVAC ASCII COBOL LEVEL 5R2 Validation Summary Report
29 Jun. 1981 67 p
(PB81-228892; CCVS74-VSR815) Avail: NTIS HC A04/MF A01 CSCL 09B

The Validation Summary Report (VSR) for the Sperry Univac ASCII COBOL Compiler Version 5R2 (1100 OS Version 37R2) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the HIGH level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language, and a detailed listing of discrepancies together with the tests which were failed. GRA

N82-13749# Federal Compiler Testing Center, Falls Church, Va.
COBOL COMPILER: NORTHERN TELECOM, INC. NTI COBOL/3 Validation Summary Report
29 Jun. 1981 50 p
(PB81-226417; CCVS74-VSR780) Avail: NTIS HC A03/MF A01 CSCL 09B

The Validation Summary Report (VSR) for the Northern Telecom, Inc. COBOL Compiler Version COBOL/3 (NTI Version 4.1) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the Low Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language, and a detailed listing of discrepancies together with the tests which were failed. GRA

N82-13750 Stanford Univ., Calif.
CAPACITY AND CODING FOR COMPUTER MEMORY WITH DEFECTS Ph.D. Thesis
Chris Douglas Heegard 1981 101 p
Avail: Univ. Microfilms Order No. 8124080

The problem of reliable message storage in an imperfect computer memory is investigated. The information that describes the state of the defects can be used to aid the encoding or decoding of messages. First, a probablistic model for computer memory with defects and noise is introduced. Algorithms are presented that can be used to compute the capacity of these memories. Next, computer memory with stuck-at defects and additive errors are examined from an algebraic viewpoint. A class of modified linear block codes is introduced to correct defects

and errors when the location and nature of the stuck-at cells is given to the encoder. Two theorems are stated that are used to prove that the class of modified linear block codes achieve capacity for these memories. Finally, the class of modified cyclic block codes is introduced. Parameters of binary codes for several block lengths are tabulated. Dissert. Abstr.

N82-13751 Stanford Univ., Calif.
CONCURRENT TESTING AND CHECKING IN COMPUTER SYSTEMS Ph.D. Thesis
David Jun Lu 1981 168 p
Avail: Univ. Microfilms Order No. 8124103

Improved techniques for designing concurrent testing and checking in computer systems are given. At the logic circuit level the design of self-checking circuits by introducing quantitative measures and figures of merit for self-checking is studied. At the computer system level, the use of watchdog processors for error-detection performed during the executive of computer programs is studied. The quantitative measures testing input fraction and secure input fraction, are defined to provide comparison of self-checking circuit designs. Figures of self-checking merit are defined to summarize data from evaluation of these measures. Three designs for self-checking implementations of linear feedback shift registers used as cyclic redundancy code encoders are evaluated. The applications of watchdog processors in concurrent testing at the system level is studied. Structural integrity checking (SIC), an error-detection technique that recognizes high level control flow structures in programs, is introduced. Dissert. Abstr.

N82-13752 Stanford Univ., Calif.
AUTOMATED PARTITIONING OF HIERARCHICALLY SPECIFIED DIGITAL SYSTEMS Ph.D. Thesis
Thomas Stephen Payne 1981 144 p
Avail: Univ. Microfilms Order No. 8124130

A methodology for automating the partitioning of the logic into physical blocks is based on information available in a hierarchically specified design. This methodology uses sets of identical logic, identified in a hierarchical design, to produce multiple used parts. Functional group information is used to increase testability and to make the physical realization more understandable. The compact nature of the hierarchical design is utilized to increase the efficiency of the partitioning process. A modal of the partitioning process is presented, including a quality function for evaluating the quality of the physical design produced. Several existing algorithms are described and evaluated. The hierarchical partitioning algorithm is heuristic and uses a constructive approach which produces results significantly better than results produced by existing algorithms. Physical designs, containing significant repeated usage of part types were produced. Dissert. Abstr.

N82-13753 Syracuse Univ., N. Y.
DIRECT EXECUTION STRING PROCESSOR Ph.D. Thesis
Daniel Joseph Pease 1981 249 p refs
Avail: Univ. Microfilms Order No. 8123932

A modular, data driven, reorganizable multiprocessor which is configured by a high order string processing language was developed. Its design is based on an applicative model of string processing. This gives rise to a non-Von Neumann model providing primitives for parsing, searching, manipulating, and modification of strings. In addition operators are defined for creating new functions from the base set. From the model on high order string processing language is developed. An architecture, which becomes the basis for the implementation is designed from the model and language. The Direct Execution String Processing (DESP) system which implements the architecture is developed. It has two basic processing modules, one for parsing/searching and one for manipulation and modification. A search/parsing memory is developed which is a linear pattern recognition structure capable of detecting variable length partially specified queries that can be overtapped. A queue memory is also developed which is a multiport memory structure supporting simultaneous read and write to variable sized partitions of the manipulation and modification modules. Dissert. Abstr.

N82-13754 Kansas State Univ., Manhattan.
DESCRIPTIVE TECHNIQUES FOR DIGITAL SYSTEM CONTAINING COMPLEX HARDWARE COMPONENTS Ph.D. Thesis
Anil Kumar Singh 1981 210 p
Avail: Univ. Microfilms Order No. 8122038

Descriptive Technique for Modules and Systems (DTMS) is a Hardware Description Language that was developed for the description of modern digital modules and systems consisting of interconnected modules. Descriptions can represent behavior or they can represent hardware parallelism. Descriptions organized in a procedural framework include one or more concurrently executing processes. The language can be used for the description of systems with synchronous, asynchronous or mixed timing modes. The Hardware Description Net (HD Net) is a model that can be used for alternative graphical representation of the processes in DTMS module descriptions. Hardware Specification Net (HS Net) was developed for graphical representation of conceptual design. A procedure was developed for the realization of control hardware for synchronous systems from HS Net specifications. Dissert. Abstr.

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N82-13755 Carnegie-Mellon Univ., Pittsburgh, Pa.
MULTI-SENSOR IMAGE REGISTRATION Ph.D. Thesis
Yair Barniv 1981 249 p refs
Avail: Univ. Microfilms Order No. 8118425

Registration of multi-sensor imagery (MSI) is considered. This scene matching problem is dominated by intensity disparity and contrast reversal differences in parts of the image. A new MSI model is advanced in which the intensity transmittances of all objectst are independent random variables and the edges in the scene are modeled as a low density Poisson process. A communcation analogy is used to arrive at the general MSI processor with several processing operators and a correlator output stages. The correlation coefficient of the data is used to determine the need for linear and nonlinear MSI preprocessing operators. Magnitude gradient, historgram shaping, spectrum whitening, and threshold selection are considered. Experimental simulations on six data bases are used to verify the MSI processing theory for different classes of MSI data. Dissert. Abstr.

N82-13756 Rochester Univ., N. Y.
A SPECIFICATION AND PROOF TECHNIQUE FOR MESSAGE-BASED SYSTEMS AND ITS APPLICATION TO DISTRIBUTED DATABASE ALGORITHMS Ph.D. Thesis
Anil Nigam 1981 279 p
Avail: Univ. Microfilms Order No. 8123996

Distributed computing with widely separated machines is an area of growing theoretical and practical interest. A distributed algorithm is abstracted as a collection of processes that communicate exclusively through message passing. Each participating process is specific as an abstract state-transition table. Various kinds of failures, relevant to distributed algorithms are discussed. An incremental design approach is demonstrated or extending tables to encode failure and recovery components. Proofs for these extended tables are also developed; some axioms characterizing process failure and recovery are proposed and validated. The specification technique is applied to several variations of the population Two-Phase Commit Protocol for atomic updates in a distributed database. Proofs are developed for the relevant properties, and failure and recovery aspects are also addressed. Finally some directions are provided about the applicability of the specification technique to database algorithms. Dissert. Abstr.

N82-13757 Rochester Univ., N. Y.
LANGUAGE, COMPUTATION, AND REALITY Ph.D. Thesis
Donald Richard Perlis 1981 202 p
Avail: Univ. Microfilms Order No. 8123998

The interplay of assertion and meaning, or quotation and unquotation, in reasoning entities is considered. The notion of possibility is analyzed in several contexts, most specifically in

relation to resource-limited computational models of belief and inference, and in the philosophy of science. A first-order treatment of quotation and unquotation is given that allows broad and paradox-free expression of syntax and semantics. It is argued that this makes unnecessary the usual hierarchical constructions for notions such as default reasoning, theory subsumption, concepts, beliefs, and self-reference. This is then applied to a model of belief and inference in which focus of attention is a key element. Effort is made to isolate certain automatic inferences apparently part of the very meaning of propositional beliefs, and then base more sophisticated thinking on these. The relationship of resource-limited computation to the notion of possibility in the foundations of physics and modal logic is discussed.
Dissert. Abstr.

N82-13758 Northwestern Univ., Evanston, Ill.
PROBABILISTIC ERROR ANALYSIS OF FLOATING POINT AND CRD ARITHMETICS Ph.D. Thesis
Jesse Louis Barlow 1981 116 p
Avail: Univ. Microfilms Order No. 8124850

The longstanding, unsolved problem of the probability distribution of roundoff errors in computer arithmetics is discussed. Probabilistic models of floating point and logarithmic arithmetic were constructed using assumptions with both theoretical and empirical justification. A probabilistic roundoff error model for fixed point arithmetic was developed. The models for floating point and logarithmic arithmetic were applied to the error from sums, extended products, polynomials in one variable, inner products, matrix computations, linear equation solving procedures both direct and iterative, and linear multistep methods for the solution of ordinary differential equations. A comparison was made of the error analysis properties of floating point and logarithmic computers. It is concluded that the logarithmic computers have smaller error confidence intervals for roundoff errors than a floating point computer with the same computer word size and approximately the same number range in any numerical computation. Dissert. Abstr.

N82-13759 Kansas State Univ., Manhattan.
COMPILER GENERATION FROM LAMBDA CALCULUS DEFINITIONS OF PROGRAMMING LANGUAGES Ph.D. Thesis
David Arlen Schmidt 1981 134 p
Avail: Univ. Microfilms Order No. 8122033

The foundations of automated compiler construction based upon lambda calculus definitions of programming languages are studied. A Scott-Strachey denotational definition written in SLAMBDA, a variant of Scott's LAMBDA notation, is utilized by an algorithm to produce a translation scheme from a source to a predefined target language. The produce translator accepts as input a correctly parsed source program (an abstract syntax tree) and produces code in the target language; the target language used in the exposition is a flowchart language extension called STM (state transition machines). Correctness of the translation scheme is facilitated by defining a semantic model for SLAMBDA: a Scott-model retract of the universal domain Pw, and a quotient model based upon a relation describing operational equivalence with respect to the term rewriting rules of the SLAMBDA system are given. The simplification of existing techniques for showing the proof of correctness of the intermediate to target translator is discussed. Dissert. Abstr.

N82-13760 Georgia Inst. of Tech., Atlanta.
COMPLEXITY OF COMMUNICATION AMONG ASYNCHRONOUS PARALLEL PROCESSES Ph.D. Thesis
James Edward Burns 1981 137 p
Avail: Univ. Microfilms Order No. 8124283

Certain problems of synchronization for systems of processes which execute asynchronously were investigated. In a system of asynchronous parallel processes, the speed of execution of each process is independent of that of all the other processes in the system and may vary as the process executes. Communication through shared variables and communication by passing messages are considered. Results using the shared variable model developed in the investigation are discussed. Dissert. Abstr.

N82-13761 Stanford Univ., Calif.
SYMBOLIC REASONING AMONG 3-D MODELS AND 2-D IMAGES Ph.D. Thesis
Rodney Allen Brooks 1981 181 p
Avail: Univ. Microfilms Order No. 8124043

An implemented and operational model-based vision system is described. Examples are given of its interpretation of images, including extraction of three dimensional parameters from monocular images. Advances are presented in representation for geometric modeling of objects and objects classes, in techniques for manipulating nonlinear symbolic algebraic constraints, in geometric reasoning incompletely specified situations, and in constructing algebraic constraints from image measurements. Both generic object classes and specific objects are represented by volume models which are independent of viewpoint. Complex real word object classes are modeled. Variations in size, structure and spatial relations within object classes can be modeled. Spatial reasoning techniques are described which are useful both for prediction within a vision system, and for planning within a manipulation system. Approaches to prediction and interpretation are introduced, based on the propagation of symbolic constraint. Dissert. Abstr.

N82-13762 Stanford Univ., Calif.
QUERY OPTIMIZATION BY SEMANTIC REASONING Ph.D. Thesis
Jonathan Jay King 1981 117 p
Avail: Univ. Microfilms Order No. 8124097

Semantic query optimization is a method which produces a semantically equivalent query that is less expensive to process than the original query. It transforms the original query into a new one by means of a process of inference. The transformations are limited to those that yield a semantically equivalent query, that is guaranteed to produce the same answer as the original query in any permitted state of the data base. A problem reformulation step for problem solving programs is investigated. Equivalent statements of the original problem are sought, one of which may have a better solution than the original problem. Semantic query optimization applies knowledge of problem domain and of the capabilities and limitations of the data base to pose the most effective and easily processed queries to solve a user's problem. Dissert. Abstr.

N82-13763 Wisconsin Univ. - Madison.
ALGORITHMS FOR THE GEOMETRY OF SEMI-ALGEBRAIC SETS Ph.D. Thesis
Dennis Soule Arnon 1981 197 p
Avail: Univ. Microfilms Order No. 8120294

Let A be a set of polynomials in r variables with integer coefficients. An A-invariant cylindrical algebraic decomposition (cad) of r-dimensional Euclidean space is a certain cellular decomposition of r-space, such that each cell is a semi-algebraic set, the polynomials of A are sign-invariant on each cell, and the cells are arranged into cylinders. The cad algorithm given by Collins provides, among other applications, the fastest known decision procedure for real closed fields, a cellular decomposition algorithm for semialgebraic sets, and a method of solving nonlinear (polynomial) optimization problems exactly. A new version of the cad algorithm is presented for r less than 3, in which one works with maximal connected A-invariant collections of cells, in such a way as to often avoid the most time-consuming algebraic number calculations. Essential to this new cad algorithm is an algorithm presented for determination of adjacenies among the cells of a cad. Computer programs for the cad and adjacency algorithms have been written. Dissert. Abstr.

N82-13764*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
STATISTICAL ENERGY ANALYSIS COMPUTER PROGRAM, USER'S GUIDE
R. W. Trudell and L. I. Yano Nov. 1981 118 p refs
(Contract NAS8-33191)
(NASA-CR-161913; MDC-G9915) Avail: NTIS HC A06/MF A01 CSCL 09B

A high frequency random vibration analysis, (statistical energy analysis (SEA) method) is examined. The SEA method accomplishs high frequency prediction of arbitrary structural configurations. A general SEA computer program is described. A summary of SEA theory, example problems of SEA program application, and complete program listing are presented. S.L.

N82-13765*# Intermetrics, Inc., Huntsville, Ala.
SEPAC SOFTWARE CONFIGURATION CONTROL PLAN AND PROCEDURES, REVISION 1
15 May 1981 40 p
(Contract NAS8-33806)
(NASA-CR-161915; IR-634-1) Avail: NTIS HC A03/MF A01 CSCL 09B

SEPAC Software Configuration Control Plan and Procedures are presented. The objective of the software configuration control is to establish the process for maintaining configuration control of the SEPAC software beginning with the baselining of SEPAC Flight Software Version 1 and encompass the integration and verification tests through Spacelab Level IV Integration. They are designed to provide a simplified but complete configuration control process. The intent is to require a minimum amount of paperwork but provide total traceability of SEPAC software. L.F.M.

N82-13766*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SURVEY OF STANDARDS APPLICABLE TO A DATABASE MANAGEMENT SYSTEM
Jose L. Urena 15 Oct. 1981 51 p refs
(Contract NAS7-100)
(NASA-CR-165009; JPL-Pub-81-88) Avail: NTIS HC A04/MF A01 CSCL 09B

Industry, government, and NASA standards, and the status of standardization activities of standards setting organizations applicable to the design, implementation and operation of a data base management system for space related applications are identified. The applicability of the standards to a general purpose, multimission data base management system is addressed. S.L.

N82-13767*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
***SOFTWARE DESIGN AND DOCUMENTATION LANGUAGE*: USER'S GUIDE FOR SDDL RELEASE 4**
T. M. Zepko 15 Sep. 1981 13 p refs Revised
(Contract NAS7-100)
(NASA-CR-165025; JPL-Pub-77-24-Rev-1-Add-1) Avail: NTIS HC A02/MF A01 CSCL 09B

The changes introduced in the PASCAL implementation of the software design and documentation language are described. These changes include a number of new capabilities, plus some changes to make the language more consistent and easier to use. Incompatibilities with earlier versions are limited to certain of the directive statements. B.W.

N82-13768*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COMPUTER VISION
Donald Gennery, Robert Cunningham, Eric Saund, John High, and Carl Ruoff 1 Nov. 1981 104 p refs
(Contract NAS7-100)
(NASA-CR-165012; JPL-Pub-81-92) Avail: NTIS HC A06/MF A01 CSCL 09B

The field of computer vision is surveyed and assessed, key research issues are identified, and possibilities for a future vision system are discussed. The problems of descriptions of two and three dimensional worlds are discussed. The representation of such features as texture, edges, curves, and corners are detailed. Recognition methods are described in which cross correlation coefficients are maximized or numerical values for a set of features are measured. Object tracking is discussed in terms of the robust matching algorithms that must be devised. Stereo vision, camera control and calibration, and the hardware and systems architecture are discussed. R.J.F.

N82-13769# Defense Communications Engineering Center, Reston, Va.
PROBLEMS WITH THE MULTITASKING FACILITIES IN THE ADA PROGRAMMING LANGUAGE
Susan Lana Zuckerman 11 May 1981 23 p refs
(AD-A105229; DCEC-TN-16-81) Avail: NTIS HC A02/MF A01 CSCL 09/2

The ADA language was designed for military embedded computer applications, and therefore its multitasking facilities will be heavily utilized in DoD software. However, ADA's multitasking facilities do not provide capabilities equivalent to current multitasking facilities in existing languages. ADA's unconventional multitasking facilities raise serious questions. Problem areas are identified and discussed, and solutions are proposed. Because ADA's multitasking facilities are only a small part of the total language, changes and improvements can be made without impacting the remainder of the language. Author (GRA)

N82-13770# Systems Control, Inc., Palo Alto, Calif. Computer Science Dept.
RESEARCH ON KNOWLEDGE BASED PROGRAMMING AND ALGORITHM DESIGN Final Technical Report, 27 Nov. 1978 - 31 Aug. 1981
Cordell Green Aug. 1981 121 p refs
(Contracts N00014-79-C-0127; N00014-80-C-0045; DARPA Order 3687; DARPA Order 3828)
(AD-A105661; SCI-ICS-L-81-5) Avail: NTIS HC A06/MF A01 CSCL 09/2

The object of our research is the codification of programming knowledge and the creation of computer systems that incorporate this knowledge that assist in the various activities of programming. We have designed and implemented the CHI knowledge-based programming system, including the 'V' wide-spectrum language for expressing both programming knowledge and program specifications. CHI has been used to synthesize several programs including parts of itself. We are extending the uses of the knowledge base to provide intelligent tools for environment to support not only program synthesis but program acquisition, modification, debugging and maintenance. Another aspect of our research is called Algorithm Design. This project emphasizes tools to assist in the more creative aspects of the creation of new algorithms. We have formalized a set of methods, primarily focused upon the incorporation of operations into generators, that seem to be a very powerful set of tools in deriving good and difficult algorithms. We have implemented some of these methods in CHI and include a discussion of the derivations in this report. GRA

N82-13771# Oak Ridge National Lab., Tenn.
ASSESSMENT OF THE COMPUTER CODE COBRA/CFTL
C. B. Baxi and C. J. Burhop Jul. 1981 238 p refs
(Contract W-7405-eng-26)
(DE81-027933; ORNL/Sub-81-92304/1; GA-A-16359) Avail: NTIS HC A11/MF A01

The COBRA/CFTL code was developed for thermal-hydraulic analysis of simulated gas-cooled fast breeder reactor (GCFR) core assemblies to be tested in the core flow test loop (CFTL). The COBRA/CFTL code was obtained by modifying the general atomic code COBRA/GCFR. These modifications are discussed. The two code results for three cases which represent conditions from fully rough turbulent flow to laminar flow are compared. Case 1 represented fully rough turbulent flow in the bundle. Cases 2 and 3 represented laminar and transition flow regimes. The required input for the COBRA/CFTL code, a sample problem input/output, and the code listing are included. DOE

N82-13772# California Univ., Livermore. Lawrence Livermore Lab.
USER'S MANUALS FOR DYNA3D AND DYNAP: NONLINEAR DYNAMIC ANALYSIS OF SOLIDS IN THREE DIMENSIONS
J. O. Hallquist Jul. 1981 96 p refs
(Contract W-7405-eng-48)
(DE81-028360; UCID-19156) Avail: NTIS HC A05/MF A01

A user's manual for DYNA3D, an explicit three-dimensional finite element code for analyzing the large deformation dynamic response of inelastic solids, is given. A contact-impact algorithm permits gaps and sliding along material interfaces. By a specialization of thmis algorithm, such interfaces can be rigidly tied to admit variable zoning without the need of transition regions. Spatial discretization is achieved by the use of 8-node solid elements, and the equations of motion are integrated by the central difference method. Post-processors for DYNA3D include GRAPE for plotting deformed shapes and stress contours and DYNAP for plotting time histories. A user's manual for DYNAP is also provided. DOE

N82-13773# California Univ., Livermore. Lawrence Livermore Lab.

SOLUTION OF SINGLE LINEAR TRIDIAGONAL SYSTEMS AND VECTORIZATION OF THE ICOG ALGORITHM ON THE CRAY 1

David S. Kershaw 25 Jun. 1981 31 p refs
(Contract W-7405-eng-48)
(DE81-025461; UCID-19085) Avail: NTIS HC A03/MF A01

The numerical algorithms used to solve the physics equation in codes which model laser fusion are examined. It is found that a large number of subroutines require the solution of tridiagonal linear systems of equations. The standard algorithm used in the past on CDC 7600's does not vectorize and so cannot take advantage of the large speed increases possible on the Cray-1 through vectorization. There is however, an alternate algorithm for solving tridiagonal systems, called cyclic reduction, which allows for vectorization, and which is optimal for the Cray-1. An alternative ICCG algorithm for the Cray-1 was developed which utilizes a block form of a cyclic reduction algorithm. This algorithm allows full vectorization and runs as much as five times faster than the old algorithm on the Cray-1. It is used in Cray LASNEX to solve the two dimensional diffusion equation in all the physics subroutines. DOE

N82-13774# Los Alamos Scientific Lab., N. Mex.

PLOT2K: A GRAPHICS INTERFACE OF SYSTEM 2000

Larry Creel 1981 7 p Presented at the ASTUTE Conf., New Orleans, Sep. 1981
(Contract W-7405-eng-36)
(DE81-028706; LA-UR-81-2265; CONF-810930-1) Avail: NTIS HC A02/MF A01

PLOT2K, an interactive graphics interface to the System 2000 data base management system is described. It runs on a CDC 6600 computer with an NOS or NOS/RE operating system. The graphics package used is DISSPLA. The PLOT2K will generate bar chart histograms, pie charts, or x-y point plots and will access any System 2000 data base. DOE

N82-13775# Sandia Labs., Albuquerque, N. Mex.

MERLIN: A COMPUTER PROGRAM TO TRANSFER FINITE-ELEMENT MESHES

D. K. Gartling Sep. 1981 45 p refs
(Contract DE-AC04-76DP-00789)
(DE82-000806; SAND-81-0463) Avail: NTIS HC A03/MF A01

The MERLIN program is described which transfers data between two dimensional, finite element meshes of arbitrary geometry. The program is structured to accurately interpolate previously computed solutions onto a given mesh and format the resulting data for immediate use in a variety of existing finite element codes. The theoretical basis and computational algorithms used in the program are described and complete user instructions are presented. Example problems in steady state conductive heat transfer in a cylinder and thermal stresses in the pillars of an underground nuclear waste repository are given. DOE

N82-13776# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.

ADAPTIVE EQUALIZATION ALGORITHMS FOR A DISPERSIVE CHANNEL Ph.D. Thesis [ALGORITHMS D'EGALISATION ADAPTATIVE D'UN CANAL DISPERSIF]

Hikmet Sari Oct. 1980 134 p refs In FRENCH
(ENST-E-80012) Avail: NTIS HC A07/MF A01

The equalization of a numerical transmission channel is studied, centering on algorithms which control adaptation of the equalizer to an unknown channel that may be slowly time variable. Two problems, i.e., tracking a nonstationary channel, and identification of a stationary channel, are considered. Two equalizers are compared: a linear nonrecursive one, and a recursive one with a decision loop. Algorithms are described and simulation results show their performance. An auto-orthogonalizing algorithm is treated in greater detail. Two alternative algorithms are then proposed. The first gives rapid convergence and is not sensitive to dispersion of the values of the received signal correlation matrix. It is obtained by replacing the Toeplitz matrix for the gain of the auto-orthogonalizing algorithm by a circulation matrix that is asymptotically equivalent to it. The algorithm is suitable for both equalizers discussed. The second algorithm proposed is noniterative; it is only well-adapted to the linear nonrecursive equalizer. Author (ESA)

N82-13777# Messerschmitt-Boelkow-Blohm G.m.b.H., Hamburg (West Germany). Unternehmensbereich Hamburger Flugzeugbau.

INCREASE IN THE PROFITABILITY OF DESIGN AND PROCESS PLANNING BY INTEGRATED AND GRAPHIC DATA PROCESSING, PHASE 1 Final Report

Rolf Feddersen, Ulrich Grupe (Vereinigte Flugtechnische Werke GmbH, Bremen, West Germany), and Juergen Nagel (Dornier-Werke GmbH, Friedrichshafen, West Germany) Bonn Bundesministerium fuer Forschung und Technologie Jan. 1981 275 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-81-005; ISSN-0170-1339) Avail: NTIS HC A12/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 43.90

The basic concepts of computer aided design systems are reviewed and generalized for application throughout the entire production process. Examples from aerospace technology are illustrated. The principles and operation modes of the selected computer-graphics interactive data-processing and programming system are exposed and its utilization assessed in the fields of lofting, structure analysis, tool design, numerical control programming, process planning and order processing. It is found that a favorable basis is thus created for the development of machine independent programs and interactive methods. Author (ESA)

N82-13778# Joint Research Centre of the European Communities, Ispra (Italy).

MESH GENERATING AND PLOTTING FACILITIES OF THE LAMCAL PROGRAM

L. G. Lamain 1980 47 p Submitted for publication
(EUR-7099-EN) Avail: NTIS HC A03/MF A01

The complete LAMCAL program consists of three parts: mesh generation; the elastoplastic finite element part; and the plotting part. The three parts are connected by means of an overlay structure using peripheral units as interfaces, which allows them to be used together, separately, or in combination with other computer programs. The mesh generation and the plotting part of the LAMCAL program are described and the input formats are given. Output formats available for mesh generation are Bersafe, Eurdyne and Semiloof. With varying degrees of effort, all kinds of two-dimensional meshes and some three-dimensional meshes (plate and solid element) may be generated. Special attention is given to meshes for crack problems. The input file for the plotting part can contain any number, and in any order, data for mesh, isofunction, and deformation plots. An existing mesh can also be plotted. Messages about available and required core are given in the program. Author (ESA)

N82-13779# Research Inst. of National Defence, Stockholm (Sweden).

A COMPARISON OF THREE PROGRAMS FOR THE CALCULATION OF SURFACE-RATIO [EN JAEMFOERELSE AV TRE PROGRAM FOER BERAEKNING AV 'YTFOERHAALLANDEN']

Per Svensson Dec. 1980 31 p refs In SWEDISH
(FOA-C-20392-D8) Avail: NTIS HC A03/MF A01

For the calculation of splinter effect on a given cylindrical target struck by a missile, two methods have been used for several years with the VERSAM program. A method for the same geometrical problems and for use in a version of the artillery efficiency model (AVM) is discussed. The three methods were developed to meet different requirements. The accuracy of the three methods is compared. The facit-method, developed for this comparison, is a severely tested extension of the above mentioned AVM-computer program. Author (ESA)

N82-13780# ERIA/ECA Automation, St. Cloud (France).

STUDY ON THE IMPLEMENTATION OF A PROGRAM FOR QUALITY CONTROL OF COMPUTER PROGRAMS, PHASE 1 Final Report [L'ETUDE DE LA MISE EN PLACE D'UN PROGRAMME D'ASSURANCE DE QUALITE DES LOGICIELS - PHASE 1]

Paris ESA Nov. 1980 127 p In FRENCH

(Contract ESTEC-4182/79/NL-PP(SC))
(ESA-CR(P)-1444) Avail: NTIS HC A07/MF A01

A coherent system of quality control for computer programs is defined. Problems arising with the different approaches available for determining the quality of a program are reviewed. Quality requirements specific to ESA are identified. A computer program quality package is presented. Subroutines for static and dynamic analyses are outlined. The ESA programming capabilities are assessed and the characteristics of a specification routine are given. The possibility of ESA's implementing this solution (time and means necessary) is estimated. Author (ESA)

N82-13781 Ohio State Univ., Columbus.
DESIGN OF A REAL TIME, INTERACTIVE, PARALLEL SIMULATION COMPUTER Ph.D. Thesis
Yukoh Kobayashi 1981 169 p
Avail: Univ. Microfilms Order No. 8121814

A parallel computer organization for interactive, real time simulations which deal with models represented in a set of ordinary differential equations is proposed. The concept of a simulation computer, having a highly parallel processing organization involving from tens to thousands of peripheral processing is introduced. The proposed computer organization is supported by an efficient method of process synchronization and data transfer among peripheral processors. While process synchronization and data transfer are traditionally carried out through (or by) processors or by a switching network, the proposed method employs specially organized memory modules which consist of a global and a local region. A simulation of the PHYSBE model, which represents the blood circulation of the human body and involves seven first order differential equations, is demonstrated using the fourth order Runge-Kutta integration method for the proposed computer. For this particular simulation model the porposed computer is estimated to be 15 times faster than the conventional digital computer, and 2.6 times faster than the analog computer. Figures of a comparison of absolute error vs. the number of integration steps per cycle and a comparison of absolute error vs. frequency are shown for various orders of the Runge-Kutta integration method. Dissert. Abstr.

N82-13782 Polytechnic Inst. of New York, Brooklyn.
SOME EXPERIMENTAL DESIGN TECHNIQUES IN IMAGE PROCESSING PROBLEMS Ph.D. Thesis
Edward S. H. Chang 1981 199 p
Avail: Univ. Microfilms Order No. 8118864

The classification, detection and enhancement of images contaminated by Gaussian and/or non-Gaussian noise are presented in the framework of the general linear model, using the techniques of experimental design with or without replications. A set of robust procedures which utilize recursive and non-recursive estimators and classifiers is presented and used to analyze and represent image data in terms of F- and t- statistics. Decision rules for estimation and classification are based on threshold values associated with various confidence levels. An object detection classifier is developed by combining the supervised learning model, hypothesis testing techniques and the robust F-statistic in conjunction with the ANOVA process. In addition, a class of robustized recursive noise detectors based on the Hartley's or Cochran's F-max statistics are developed. Dissert. Abstr.

N82-13783 Syracuse Univ., N. Y.
METHODS OF VERIFICATION OF DIGITAL LOGIC Ph.D. Thesis
Vijayaraghavan Pitchumani 1981 202 p
Avail: Univ. Microfilms Order No. 8123933

Proof techniques are presented for use at both low and high levels of hardware verification. To help in the design of provable logic, a structured register transfer language is defined and an axiomatic definition of its semantics is given. Formal rules for the translation of a description into hardware are discussed. Two techniques, static and dynamic analyses for proof of an implementation are contrasted in terms of their capabilities. At a higher level, techniques are given for the proof of correctness of both serial and parallel control sequences using an assertions approach. These techniques are compared with those used in software. Finally the mechanizability of all the techniques given are discussed. Dissert. Abstr.

N82-13784 Stanford Univ., Calif.
TRELLIS DATA COMPRESSION Ph.D. Thesis
Lawrence Colm Stewart 1981 137 p
Avail: Univ. Microfilms Order No. 8124158

Tree and trellis data compression systems, using a tree or trellis search algorithm to improve the performance of traditional coding systems, are discussed. The possibility of designing tree and trellis codes which are well matched to particular sources using vector quantization was investigated. The main design procedure iterates on a long training sequence to improve the performance of an initial trellis decoder. An additional procedure given a trellis decoder can produce a decoder of longer constraint length which performs at least as well. Combined, these algorithms provide a complete design procedure for trellis encoding data compression systems. For random sources, many existing data compression systems can be readily improved and performance close to the rate-distortion bound can be obtained. In the applications area of speech compression, tree and trellis codes designed with these algorithms permit the construction of low rate speech waveform coders, low rate residual excited linear predictive coders, and a kind of hybrid tree coder. Dissert. Abstr.

62 COMPUTER SYSTEMS

Includes computer networks.

No abstracts in this category.

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support*.

N82-13785 Oklahoma State Univ., Stillwater.
COMPUTER IMPLEMENTATION OF OPTIMAL MULTIVARIABLE CONTROLLER DESIGN IN THE FREQUENCY DOMAIN Ph.D. Thesis
John Edward Perrault, Jr. 1981 129 p
Avail: Univ. Microfilms Order No. 8123850

The numerical computation of optimal controllers using frequency domain synthesis theory are investigated. A synthesis theory is identified and a generalized computation method for obtained necessary transfer function matrices directly from block diagrams is developed. The logical structure of a computer program for optimal controller design is presented. The use of exact arithmetic based on both p-ary and finite field p-adic number systems as well as the use of a symbolic polynomial manipulation program are investigated. The problems associated with the use of finite precision, floating point arithmetic are identified and solutions for the problems are outlined. The many individual algorithms required by the controller design program are identified and analyzed. Dissert. Abstr.

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N82-13786 Wisconsin Univ. - Madison.
A CONTROL CANONICAL FORM FOR A CLASS OF LINEAR HYPERBOLIC SYSTEMS Ph.D. Thesis
Russell George Teglas 1981 174 p
Avail: Univ. Microfilms Order No. 8120337

Reduction of the eigenvalue placement problem for a class of linear autonomous systems of the form dot x = Ax + bu to the corresponding problem for a scalar neutral functional equation. The reduction relies heavily upon the basic properties of the sequence of eigenfunctions associated with A as well as various

properties of non-harmonic Fourier series it is shown. A criterion for the eigenfunctions to form a uniform or Riesz basis is provided and then how a certain class of linear symmetric hyperbolic systems in one space variable may be cast into this abstract framework. Harmonic analysis of the above scalar equation then yields eigenvalue placement results for feedback laws of the form u(t) = (f, x(t)). An application to a problem involving the propagation of electrical signals along a transmission line is included. Dissert. Abstr.

N82-13787 California Univ., Riverside.
THE LEAST FIXED POINT PROPERTY FOR OMEGA CHAIN CONTINUOUS FUNCTIONS Ph.D. Thesis
Joe Don Mashburn 1981 44 p
Avail: Univ. Microfilms Order No. 8122916

The basic definitions are given, including those for omega chain continuity, omega chain completeness, and the least fixed point property for omega chain continuous functions. Some of the relations between completeness and fixed point properties in partially ordered sets are stated. Two examples are given showing that a partially ordered set need not be omega chain complete to have the least fixed point property for omega chain continuous functions. Retracts are discussed where it is seen that they are not sufficiently to characterize those partially ordered sets having the least fixed point property for omega chain continuous functions. The relation between finite width and the least fixed point property for omega chain continuous functions is explored. Finally, the notion of a layered partially ordered set and some of its problems are discussed. It is concluded that a partially ordered set in which every antichain is finite and every chain contains a countable cofinal subchain is omega chain complete if and only if it has the least fixed point property for omega chain continuous functions. Dissert. Abstr.

N82-13788 Syracuse Univ., N. Y.
ZEROS OF SUCCESSIVE DERIVATIVES OF SOME ENTIRE FUNCTIONS OF INFINITE ORDER Ph.D. Thesis
Tsegay Moges 1981 68 p
Avail: Univ. Microfilms Order No. 8123925

Some aspects of a general problem concerning the zeros of successive derivatives of some real, entire functions of infinite order are considered. Functions of the form g(z) = q(z)exp(-e sub z) are studied where the position of the zeros of the real entire function q(z) satisfy some mild restrictions and the growth of the absolute value of q(z) is negligible compared to exp(-e sub z). The work requires an asymptotic evaluation based on the method of steepest descent. A saddle point must be deterined with great accuracy. The effect of the factor q(z) on the number of zeros is investigated. Dissert. Abstr.

N82-13789 Purdue Univ., Lafayette, Ind.
A MIXED VARIATIONAL PRINCIPLE FOR FINITE ELEMENT ANALYSIS Ph.D. Thesis
Michael Lee Day 1981 126 p
Avail: Univ. Microfilms Order No. 8123633

A mixed variational principle is developed and utilized in a finite element formulation. The procedure is mixed in the sense that it is based upon a combinational of the potential and complementary energy principles. The principle evolves from alleviating two drawbacks associated with more traditional approaches. Theses include the problems with interelement continuity and the favoring of displacements over stresses, or vice versa. In order to achieve the desired effect of relaxing the troublesome continuity requirements and to put the displacements and stresses on a more equal footing, it was necessary to modify the potential and complementary principles with Lagrange multipliers. Then both modified principles are simultaneously employed so as not to bias either the compatibility or equilibrium conditions. This gives birth to a finite element formulation which abandons the nodal concept and instead has generalized parameters as it degrees of freedom. Dissert. Abstr.

N82-13790# Rutgers - The State Univ., Piscataway, N. J. Dept. of Mechanical and Aerospace Engineering.
GENERATION OF ORTHOGONAL AND NEARLY ORTHOGONAL BOUNDARY-FITTED COORDINATES WITH DIRECT CONTROL OF GRID SPACING
M. Visbal and Doyle D. Knight Jul. 1981 36 p refs Backup document for AIAA Synoptic, 'Generation of Orthogonal and Nearly Orthogonal Coordinates with Grid Control near Boundaries', scheduled for publication in AIAA Journal in Feb. 1982
(LOG-J12610) Avail: NTIS HC A03/MF A01

A numerical procedure is presented for the generation of boundary-fitted curvilinear coordinates with controllable mesh spacing and orthogonality. The technique is based on a straightforward two-step procedure involving the solution of Poisson's equation. The method is capable of generating orthogonal grids with partial control of the mesh spacing, or nearly-orthogonal grids with strict direct control of mesh spacing. The inhomogeneous terms in the Poisson equations are automatically adjusted during the grid generation. The technique is applicable to two-dimensional simple-connected regions typical of airfoils, cascades, diffusers, inlets, and nozzles. Author

N82-13791# Wisconsin Univ. - Madison. Mathematics Research Center.
A NONLINEAR CONSERVATION LAW WITH MEMORY
J. A. Nohel Aug. 1981 40 p refs
(Contract DAAG29-80-C-0041)
(AD-A103882; MRC-TSR-2251) Avail: NTIS HC A03/MF A01 CSCL 12/1

A history boundary value problem for a nonlinear conservation with fading memory in one space dimension is examined in relation to the motion of a nonlinear, one dimensional viscoelastic body. Using a variant of an energy method applied to the viscoelastic problem it is shown that under physically reasonable assumptions the nonlinear conservation law has a unique, classical solution (global in time), provided the data are sufficiently smooth and small in a suitable norm, moreover, the solution and its first order derivatives decay to zero as t approaches infinity. The proof illustrates the versatility of the energy method combined with frequency domain techniques for Volterra operators. A preliminary analysis is presented concerning the development of singularities in smooth solutions of the conservation law (in finite time) for sufficiently large smooth data; under special assumptions it is shown that such singularities necessarily develop. M.G.

N82-13792# Wisconsin Univ. - Madison. Mathematics Research Center.
THE RELATIONSHIP BETWEEN THE NUMBER OF FACTORS AND SIZE OF AN EXPERIMENT
D. V. Lindley Jul. 1981 28 p ref
(Contract DAAG29-80-C-0041)
(AD-A103877; MRC-TSR-2246) Avail: NTIS HC A03/MF A01 CSCL 12/1

A medical diagnostic problem is used to examine the relationship between the number of factors and size of an experiment. It is shown that in this and similar cases the size of the experiment must increase to achieve a satisfactory analysis - in fact, the increase is exponentially fast. The basic, mathematical tool is the Kullback-Leibler number which measures the discrimination between the possibilities. Calculation of these members uses interactions, forming a basis for all the effects that might occur. M.G.

N82-13793# Texas A&M Univ., College Station. Research Foundation Office.
NEW OPTIMIZATION RESEARCH Final Report, 1 May 1978 - 31 Dec. 1980
Jun. 1981 41 p
(Contract N00014-78-C-0426)
(AD-A104864) Avail: NTIS HC A03/MF A01 CSCL 12/1

The development and application of several optimization techniques are briefly reviewed. Smooth nonparametric regression by quadratic programming, integer programming and optimal capacities and locations for distribution centers, statistical treatment of PERT critical path analysis, linear programming in statistical estimation problems (L sub 1 estimation), and statistical control of nonlinear programming are addressed. M.G.

N82-13794# Johns Hopkins Univ., Baltimore, Md. Dept. of Mathematical Sciences.
STRONG CONVERGENCE OF NEAREST NEIGHBOR REGRESSION ESTIMATORS
Philip E. Cheng (Houston Univ.) Jun. 1981 9 p refs
(Contract N00014-79-C-0801)

(AD-A104479; TR-347; ONR-TR-81-7) Avail: NTIS HC A02/MF A01 CSCL 12/1

Nonparametric estimates of the nearest neighbor type are used in the estimation of a regression function given a set of random variables. J.M.S.

N82-13795# Johns Hopkins Univ., Baltimore, Md. Dept. of Mathematical Sciences.

ERROR BOUNDS FOR RECONSTRUCTION OF A FUNCTION f FROM A FINITE SEQUENCE (SGN(ft SUB i) + x SUB i))

Alan F. Karr and Robert J. Serfling May 1981 20 p refs

(Contract N00014-79-C-0801)

(AD-A104477; TR-341; ONR-TR-81-4) Avail: NTIS HC A02/MF A01 CSCL 12/1

Consider reconstructing a function f(t), O < or equal to t < or equal to 1, from knowledge only of (t) sub i, (s) sub i, 1 < or equal to i < or equal to n), where s sub i = sgn(f(t)sub i) + (x)sub 1), 1 < or equal to i < or equal to n, and the x sub i are additive corruptions. Without the components x sub i, f could not be reconstructed. However, for f continuous and for random uniform noise x, Masry and Cambanis (1980, 1981) show that f can be consistently estimated almost surely and in mean square as n goes to infinity and establish rates of uniform convergence. Through a somewhat different treatment, in which the approximation of f(t)sub i is identified as a numerical integration problem rather than a statistical problem, simple exact bounds are obtained on the error of estimation, the noise x is allowed to be arbitrary (random or deterministic), and the case of f having discontinuities is addressed. The bounds yield substantially improved rates of convergence when the noise values x sub i are from a quasi-random instead of random sequence. M.D.K.

N82-13796# George Washington Univ., Washington, D.C. Inst. for Management Science and Engineering..

SOLVING MULTIACTIVITY MULTIFACILITY CAPACITY-CONSTRAINED 0-1 ASSIGNMENT PROBLEMS

Krishan Lal Chhabra 12 May 1981 121 p refs

(Contract N00014-80-C-0169; NR Proj. 347-059)

(AD-A102583; T-441) Avail: NTIS HC A06/MF A01 CSCL 12/1

A branch-and-bound solution algorithm and a computer program implementing this algorithm are developd to sole multiactivity multifacility capacity-constrained 0-1 assignment problems. Such 0-1 integer programming problems have the objective of minimizing the sum of variable costs due to the assignment of the activities to designs and fixed costs due to the inclusion of the facilities chosen. The constraints ensure that each activity is assigned to a single design and that the capacities of the facilities chosen are not exceeded. Each design involves the use of one or more facilities, and the same design may be used for several activities. The formation of the problem, the mathematical deveopment of the branch-and-bound solution algorithm, a detailed test example, and computational test results using the computer program are included. Areas of application are identified, and consideration for further improvement of the branch-and-bound solution are also included. GRA

N82-13797# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.

PRELIMINARY ANALYSIS OF A BREADTH-FIRST PARSING ALGORITHM: THEORETICAL AND EXPERIMENTAL RESULTS

William A. Martin, Kenneth W. Church, and Ramesh S. Patil Jun. 1981 86 p refs

(Contracts N00014-75-C-0661; PHS-1-P11-LM-03374-02)

(AD-A101852; MIT/LCS/TR-261) Avail: NTIS HC A05/MF A01 CSCL 12/1

Earley's context-free parsing algorithm was adapted to the parsing of difficult sentences. A sentence level parser which finds all parsers of a sentence was implemented in a compiled rather than an interpreted form, permitting the grammar to be written directly as programs rather than as a data structure to be interpreted by a separate parsing program. Speed increases of at least an order of magnitude over interpreted implementation were achieved. Special case processing algorithms were added. GRA

N82-13798# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.

A SHARPER ESTIMATE OF THE RENEWAL FUNCTION

Hasse Carlsson 1980 11 p refs

(CTH-Math-1980-18) Avail: NTIS HC A02/MF A01

Remainder term estimates of the renewal function of a strongly non-lattice measure with finite moments of order alpha < or equal to 2 are considered. The estimates are obtained by Fourier methods and improve on previous results. As steps in deriving the estimates, an expression for U(x) equal to o(x exp(-alpha)), as mod x approaches infinity, alpha < or equal to 2, is proved, and an expression for alpha < or equal to 3 is derived. These two lemmas are used to prove and simplify the estimates in the cases of alpha < or equal to 2 and alpha < or equal to 3. Author (ESA)

N82-13799# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.

PROVING TOTAL CORRECTNESS OF NONDETERMINISTIC PROGRAMS IN INFINITARY LOGIC

R. J. R. Back Oct. 1980 32 p refs Submitted for publication

(MC-IW-150/80) Avail: NTIS HC A03/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 4

The formalization in infinitary logic of the weakest precondition approach to prove total correctness of nondeterministic programs was shown. The technique is extended to hierarchically structured programs by adding a primitive statement for operational abstraction, the nondeterministic assignment statement, to the guarded commands of Dijkstra. The infinitary logic is strong enough to express the weakest preconditions for Dijkstra's guarded commands, but too weak for the extended guarded commands. Two possible solutions are considered: (1) going to an essentially stronger infinitary logic, and (2) restricting the power of the nondeterministic assignment statement such that the nondeterministic choice is always made from a finite set of alternatives. Author (ESA)

N82-13800# Royal Inst. of Tech., Stockholm (Sweden). Dept. for Numerical Analysis and Computing Science.

HIGH ORDER APPROXIMATIONS TO EIGENSOLUTIONS OF STURM-LIOUVILLE PROBLEMS BY DEFERRED CORRECTIONS

Bengt Lindberg 1981 14 p refs Sponsored in part by Bielefield Univ.

(TRITA-NA-8104) Avail: NTIS HC A02/MF A01

Sturm-Liouville eigenvalue problems for ordinary differential equations are discretized with second order accurate formulas. Increasingly accurate approximations are computed by solving a sequence of perturbed problems, where each problem can be efficiently solved by a technique similar to inverse iteration. The perturbations are computed by compact deferred correction formulas. Author (ESA)

N82-13801# Royal Inst. of Tech., Stockholm (Sweden). Dept. for Numerical Analysis and Computing Science.

POINTWISE ERROR ESTIMATION FOR FINITE ELEMENT DISCRETIZATIONS, PART 1

Bengt Lindberg 1981 17 p refs

(TRITA-NA-8105-Pt-1) Avail: NTIS HC A02/MF A01

A technique for solving boundary value problems for ordinary differential equations is examined. Ideas are also applicable to partial differential equations. The error estimation algorithm is derived by heuristic arguments based on experience with finite difference discretizations of operator equations. Error estimates are correct to at least two significant digits. Author (ESA)

N82-13802# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.

STEENROD OPERATIONS IN SPECTRAL COHOMOLOGY THEORIES Ph.D. Thesis - Illinois Univ.

Thomas Weibull 1981 95 p refs

(CTH-Math-1981-06) Avail: NTIS HC A05/MF A01

Certain properties of Eilenberg-Maclane spectra that allow definition of Steenrod operations are abstracted, and the notion of a Gamma (a)-spectrum is arrived at. This is a ring spectrum E, whose characteristics are given. An expression defining

operations is derived which gives cohomology operations if E is an Omega-spectrum. The process for achieving stability and definability for non Omega-spectra is shown. Internal operations using slant product with sequences of defined elements are given and the case for considering finite coefficients presented. Examples of Gamma (a)-spectra are formulated. The dependence of stable internal slant product operations on the E-cohomological structure of the group is discussed. As a comment on the relationship between the slant product and the Kuenneth formula approach to internal operations, a natural homomorphism from the Ext to the Tor Kuenneth formula in ordinary cohomology is offered.
Author (ESA)

N82-13803# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
ON GENERAL 1 EXP P SUMMABILITY METHODS
Bo Johansson 1981 17 p refs
(CTH-Math-1981-07) Avail: NTIS HC A02/MF A01

The best possible conditions for a rapidly decreasing function to fulfill certain relationships, with a specified discrete tempered distribution where the mass points are well separated, are derived, using Jensen's inequality. Two lemmas necessary for the proof of the theorem are shown, in the first case using the Poisson's summation formula and the Fourier transform of a tempered distribution, and in the second deriving an expression for the existence of a particular function of a sequence of real numbers satisfying predetermined conditions. Author (ESA)

N82-13804 Northwestern Univ., Evanston, Ill.
AN ALGEBRAIC MODEL OF FAULT MASKING LOGIC Ph.D. Thesis
Thomas Frank Schwab 1981 148 p
Avail: Univ. Microfilms Order No. 8125007

The model allows the error-propagating and error-correcting characteristics of FML to be accurately defined by a vectorized form of Boolean algebra in terms of a syndrome-like function. Under the assumption of bitwise logical operations, the model yields the necessary and sufficient conditions for FML to exist in arbitrarily complx logic structures. FML is a hardwired form of fault tolerance using massive hardware redundancy techniques to implicitly correct hardware faults. The massive hardware redundancy requirements of FML are not considered critical because of the emerging expectations of extremely high-levels of integrated circuit technology. Since traditional maintenance and error-recovery procedures arenot necessarily required, FML can potentially simplify the hardware and software recovery design of high availability systems. Dissert. Abstr.

N82-13805 Wisconsin Univ. - Madison.
ON THE DEPENDENCE OF THE GROWTH OF AN ENTIRE FUNCTION OF THE DISTRIBUTION OF THE ZEROS OF ITS DERIVATIVES AND A CONJECTURE OF G. POLYA Ph.D. Thesis
Li-Chien Shen 1981 87 p
Avail: Univ. Microfilms Order No. 8117535

The dependence of the growth of an entire function on the distribution of the zeros of its derivatives and the classification of the entire functions which together with all their derivatives have only real zeros are investigated. A theorem which states that if f(z) is a real entire function (i.e., real on the real axis) with only real zeros and the zeros of f(z) form an A-set, then lnlnM(r,f) = O(rinr) is generalized. It is shown that the condition of reality on f may be dropped. One may also drop the condition of reality on the zeros of f and replace it by the weaker requirement that the zeros of f form an A-set. The problem of classifying the entire functions which together with all their derivatives have only real zeros is explored. The classification is completed in all cases and it is shown that it is sufficient to consider the function and its first two derivatives. Dissert. Abstr.

N82-13806 State Univ. of New York at Binghamton.
THE MISSING BOUNDARY PROBLEM FOR SMOOTH MANIFOLDS OF DIMENSION GREATER THAN OR EQUAL TO SIX Ph.D. Thesis
Gary Francis OBrien 1981 47 p
Avail: Univ. Microfilms Order No. 8124472

Let M be a non-compact differentiable manifold of dimension > 6. Suppose both M and the differential of M are 1-ended spaces. Necessary and sufficient conditions for M to be diffeomorphic to the complement of a compact subset of the boundary of a compact manifold are given. There are four conditions: two geometric conditions and two algebraic obstructions. Examples to show that these obstructions are not always trivial are given. An exmple of a manifold which does not have a completion but where any tubular neighborhood of codimension > 3 has a completion is constructed. We also classify the different ways to complete a given manifold. Dissert. Abstr.

N82-13807 Georgia Inst. of Tech., Atlanta.
SOLUTION OF INITIAL-VALUE PROBLEMS FOR SOME INFINITE EVENTUALLY PERIODIC CHAINS OF HARMONIC OSCILLATORS Ph.D. Thesis
Samuel Ray Glidewell 1981 177 p
Avail: Univ. Microfilms Order No. 8124502

Initial-value problems for some chains of harmonic oscillators when the physical parameters of the chain are eventually periodic and the initial conditions are of slow growth are investigated. The eventually periodic physical parameters and initial conditions of slow growth for fully infinite and half-infinite chains are defined. A procedure is described for solving the equations of motion of the half-infinite, frictionless, eventually periodic chain of harmonic oscillators when an arbitrary initial displacement and velocity are prescribed for one mass only, the remaining masses being initially stationary in their equilibrium positions. A method is described for solving the equtions of motion of the fully infinite, frictionless, eventually periodic chain of harmonic oscillators when arbitrary nonzero initial displacements and velocities are prescribed for any finite number of masses. A finite spring-mass system arranged in a closed loop is described, and the initial-value problem associated with this finite system is formulated. The equations of motion of the half-infinite uniform chain of harmonic oscillators are solved when the initial conditions are of slow growth.
Dissert. Abstr.

N82-13808 Rochester Univ., N. Y.
THE EXISTENCE OF NONZERO MAPS FROM INJECTIVES TO PROJECTIVES Ph.D. Thesis
Jeffrey Warren Neslen 1981 40 p
Avail: Univ. Microfilms Order No. 8123995

Let R be a ring. The existence of nonzero maps from injective to projective R-modules is studied. The conditions on R which will insure the existence of such maps are determined. After establishing several equivalent formulations of the problem, examples are considered. Commutative Artinian and Noetherian rings are investigated. In the Artinian case, it is established that any nonzero R-module, injective or not, admits a nonzero mop into R. The case where R is commutative Noetherian is studied.
Dissert. Abstr.

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N82-13809 Polytechnic Inst. of New York, Brooklyn.
A CONTRIBUTION TO ROBUST DETECTION AND ESTIMATION Ph.D. Thesis
Chee Tsai 1981 268 p
Avail: Univ. Microfilms Order No. 8118902

Generation of detection and estimation procedures which are robust with respect to such statistical assumption as nominal distribution, independence and identically distributed samples are presented. In the first part two philosophies in the approach to robust detection based on the partition detector and Huber's min-max theory are integrated to yield a class of adaptive robust detectors. In the second part, a robust, nonparametric, recursive and rapidly converging least-integral-square-error density estimators is constructed and then applied to improve the asymptotic efficiencies of stochastic approximation algorithms yielding recursive estimators which behave asymptotically like parametric maximum likelihood estimators. In the next part, equivalence between Huber's m-estimators and stochastic approximation algorithms is given, leading naturally to a robust, recursive, computationally attractive RMSA type estimators based on the

m-internal polynomial approximation (MIPA) concept. In the fourth part, the MIPA approach is then applied to Kalman filters. In the last part, the MIPA method is extended naturally to the problem of robust identification. Dissert. Abstr.

N82-13810 Oklahoma State Univ., Stillwater.
A STOCHASTIC EXTENSION OF THE STRUCTURAL PROPERTIES OF COMPARTMENT MODELS VIA A KRONECKER ALGEBRA Ph.D. Thesis
Richard Jay Weidner 1981 112 p
Avail: Univ. Microfilms Order No. 8123474

The deterministic theory of compartment models is extended through the addition of stochastic properties. The concept of identification and Monte Carlo analysis is used to examine structural properties. A Monte Carlo experiment was performed indicating definite sample period bounds for identification. The measure of error was the variance of the compartmental states. It was suggested that structural properties for the mean have influence on the dynamic variance. A Kronecker algebra was proposed and examined at some depth for a simplification transformation for the matrix Lyapunov derivative equation. As a result of the Kronecker transformation, it was illustrated that indeed the proprties, boundedness, monotonicity, etc., of the mean are preserved in the variance. Guidelines were set forth for modifying the basic relaxation identification experiment to take advantage of these new properties for the state variance. Dissert. Abstr.

N82-13811 Northwestern Univ., Evanston, Ill.
SOME SMALL SAMPLE NON-PARAMETRIC SPACE-TIME CLUSTERING TESTS Ph.D. Thesis
Angela Ko Quinn 1981 238 p
Avail: Univ. Microfilms Order No. 8124984

The problem of a special class of space-time clustering tests for detecting possible contagion among cases of disease of rare occurrence and unknown etiology is considered. Nine tests available for the analysis of clustering in small data sets are examined, appropriate ones are suggested, and guidelines for choosing among them are provided. The statistical distribution of Knox's X, cell occupancy score K, and the empiric cluster bar m sub 1 are compared. Simulated data of known distribution is used to test the ability of all the tests to detect different degrees of clustering. A structure for random location of events with a much stronger definition of randomness is defined. Three tests are considered under this structure. Since a precise structure for the alternate hypothesis would be equally desirable, a structure modelled on simple one-step Markov dependence is presented. Dissert. Abstr.

N82-13812 Stanford Univ., Calif.
SEQUENTIAL STOCHASTIC CONSTRUCTION OF RANDOM POLYGONS Ph.D. Thesis
Edward Ian George 1981 140 p
Avail: Univ. Microfilms Order No. 8124071

A sequential stochastic process is developed from which an independent and identically distributed sample of polygons is extracted with a stopping time. The distribution of polygons so obtained is identical to the distribution of polygons in the Poisson field. The stochastic process is developed in full generality and applied to anisotropic cases as well as isotropic case. Useful families of anistropic distributions for this problem are defined. The sequential stochastic process is used to derive general analytical expressions for polygon distributions for the investigation of the unknown distributions of N, S and A. The basis for very fast computer simulation is provided. A Monte Carlo study of the distributions of N, S, and A in various cases is presented. In particular, a sample of 2,500,000 polygons in the isotropic case provides the most precise results to data. Dissert. Abstr.

N82-13813 Tennessee Univ., Knoxville.
PREDICTION OF AERODYNAMIC LOADS ON AIRCRAFTS WITH EXTERNAL STORES AT TRANSONIC SPEEDS Ph.D. Thesis
Chandrasekaran Balasubramanyan 1981 204 p
Avail: Univ. Microfilms Order No. 8123139

The Integral equation method was applied to calculate the pressure distribution over an arbitrary, three dimensional lifting wing and a three dimensional wing with an external store, kept beneath the wing. A method to calculate the interference effects imposed by an external store on the wing and vice-versa is given. The wing along transonic solution is analyzed and compared with the experimental results and as well as a wing with an external store. A theory for the flow field nonlinear velocity prediction is developed, programmed, and applied to a wing with an external store configuration and the flow field velocities are compared with the experimental results. The numerical methods for solving the triple and double integrals with limits to infinity are studied and the application of one such method to the flow field prediction problem is briefly indicated. Further extension of this work is indicated with the limitations and advantages. Dissert. Abstr.

N82-13814# Army Materiel Systems Analysis Activity, Aberdeen Proving Ground, Md.
CONFIDENCE INTERVALS FOR THE RELIABILITY OF A FUTURE SYSTEM CONFIGURATION
Grady W. Miller Sep. 1981 15 p refs
(AD-A105031; AMSAA-TR-343) Avail: NTIS HC A02/MF A01 CSCL 12/1

An inferential procedure is presented which provides confidence intervals for a future reliability parameter when reliability growth testing is only partially completed. Hypothesis tests based on this method are uniformly most powerful unbiased. These results are applicable if (1) the system failure rate can be modeled as the intensity function of a Weibull process; and (2) efforts to improve reliability are assumed to continue at a steady rate throughout the intervening period of testing. The usefulness of this methodology is illustrated by evaluating the risk of not reaching some future reliability milestone. If such risk is unacceptably high, program management may have time to identify problem areas and take corrective action before testing has ended. As a consequence, a more reliable system may be developed without incurring overruns in the scheduling or cost of the development program. Author (GRA)

N82-13815# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.
ASSESSING PROBABILITY ASSESSORS: CALIBRATION AND REFINEMENT
Morris H. Degroot and Stephen E. Fienberg Jul. 1981 29 p refs
(Contract N00014-80-C-0637; Grant NSF SES-79-06386)
(AD-A104174; TR-205) Avail: NTIS HC A03/MF A01 CSCL 12/1

A probabilistic framework for weather forecasters into which to set the problems of assessing probability assessors was developed. The probability distribution of conditional probabilities and the link between the refinement concept and sufficience in the comparison are demonstrated. Scoring rules for sample situations and indications of how they relate to the probablistic concepts of calibration and refinement are reviewed. It is shown that the loss of orientation leads to the inability to recalibrate a forecaster's assessment. Extensions of calibration and refinement structure to forecasting problems are also discussed. E.A.K.

N82-13816# Educational Testing Service, Princeton, N. J.
AN UPPER ASYMPTOTE FOR THE THREE-PARAMETER LOGISTIC ITEM-RESPONSE MODEL
Mark A. Barton and Frederic M. Lord Jul. 1981 112 p refs
(Contract N00014-80-C-0402; NR Proj. 150-453)
(AD-A103013; ETS-RR-81-20) Avail: NTIS HC A06/MF A01 CSCL 12/1

An upper-asymptote parameter was added to the three-parameter logistic item response model. This four-parameter model was compared to the three-parameter model on four data sets. The fourth parameter increased the likelihood in only two of the four sets. Ability estimates for the students were generally unchanged by the introduction of the fourth parameter. R.J.F.

N82-13817# Decision Research Corp., Eugene, Oreg.
CALIBRATION OF PROBABILITIES: THE STATE OF THE ART TO 1980
Sarah Lichtenstein, Fischhoff Baruch, and Lawrence D. Phillips Jun. 1981 59 p refs
(Contracts N00014-80-C-0150; N00014-73-C-0438)
(AD-A101986; PTR-1092-81-6) Avail: NTIS

HC A04/MF A01 CSCL 12/1

This paper presents a review of research literature on an aspect of probability assessment called 'calibration' is presented. Calibration measures the validity of probability assessments and is critical for optimal decision making and for the development of decision aiding techniques. GRA

N82-13818# California Univ., Livermore. Lawrence Livermore Lab.

MONTE CARLO CALCULATIONS OF CHANNELING RADIATION

S. D. Bloom, B. L. Berman, D. C. Hamilton, M. J. Alguard (Measurex Corp.), J. H. Barrett (ORNL), Sheldon Datz (ORNL), R. H. Pantell (Stanford Univ.), and R. L. Swent (Stanford Univ.) 1981 19 p refs Presented at the 9th Intern. Conf. on Atomic Collisions in Solids, Lyon, 6 Jul. 1981

(Contract W-7405-eng-48)

(DE81-027655; UCRL-85778; CONF-810728-4) Avail: NTIS HC A02/MF A01

Classical Monte Carlo calculations are presented for the radiation produced by ultra relativistic positrons incident in a direction parallel to the (110) plane of Si in the energy range 30 to 100 MeV. The characteristic channeling radiation (CR) peak in the energy range 20 to 100 keV is shown, the centroid energies, widths, and total yields of the CR peaks are plotted as a function of energy show the power law dependences of gamma (15), gamma (17), and gamma (25) respectively. Agreement with experimental data is good for the centroid energies and only rough for the widths. DOE

N82-13819 Purdue Univ., Lafayette, Ind.

A BAYESIAN APPROACH TO THE SYMMETRIC MULTIPLE COMPARISONS PROBLEM IN THE TWO-WAY BALANCED DESIGN Ph.D. Thesis

Liwen Alice Sun 1981 171 p

Avail: Univ. Microfilms Order No. 8123713

A class of Bayes rules is constructed for the comparison of all pairs of means resulting from combinations of treatment levels in a balanced two-factor design. Each Bayes rule for the overall multiple comparisons problem is shown to result from the simultaneous applications of the corresponding Bayes rules for all component pairwise comparison problems. A computer program for simultaneously implementing the component Bayes rules is constructed. An important feature of this program is the use of bounds on the posterior Bayes risk function which in many cases enable the action with minimum posterior risk to be chosen without having to explicity calculate these posterior risks, reducing computer time. Nevertheless, the exact Bayes rules are expensive in terms of computer time. For this reason, a large-sample aproxmation to the Bayes rule is proposed which is much easier (and cheaper) to apply, and which performs similarly to the exact Bayes rule on a diversity of examples of data of moderate sample size (error d.f. = 15,30) taken from standard statistical textbooks. Dissert. Abstr.

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N82-13820# Minnesota Univ., Minneapolis. Dept. of Computer Sciences.

PARALLEL SCHEDULING ALGORITHMS

Eliezer Dekel and Sartaj Sahni Mar. 1981 30 p refs

(Contract N00014-80-C-0650)

(AD-A103796; TR-81-1) Avail: NTIS HC A03/MF A01 CSCL 12/2

Fast parallel algorithms are obtained for several scheduling problems. Some of the problems considered are: scheduling to minimize the number of tardy jobs; job sequencing with deadlines; scheduling to minimize earliness and tardiness penalties; channel assignment; and minimizing the mean finish time. The shared memory model of parallel computers is used. GRA

N82-13821# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.

TRANSFORMING CONTINGENCY TABLES

Michael M. Meyer Aug. 1981 39 p refs

(Contract N00014-80-C-0636)

(AD-A104182; TR-214) Avail: NTIS HC A03/MF A01 CSCL 12/2

There are many numerical procedures for calculating the maximum likelihood estimates for loglinear models of frequency data. The most popular methods are the Iterative Proportional Fitting Procedure (IPFP) and variants of Newton's method. For problems involving a large number of parameters, Newton's method is often impractical. As the basic IPFP is a well understood, robust, and widely available algorithm it would often be desirable to cajole a given problem into a form where the IPFP can be applied. A general theorem on transforming contingency tables is presented. Several applications of this transformation technique allowed us to take advantage of the IPFP and resulted in simple and useful procedures. A further advantage of this technique is that it is sometimes possible to recognize closed-form estimates in the transformed problem while they would be overlooked in the original setting. Author

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N82-13822 South Carolina Univ., Columbia.

QUANTUM FRAMES OF REFERENCE Ph.D. Thesis

Tirza Kaufherr 1981 99 p

Avail: Univ. Microfilms Order No. 8123423

The idea that only relative variables have physical meaning is carried over to quantum theory. Finite mass, macroscopic reference frames, relative to which all physical quantities are measured, are considered. During the process of measurement, a finite mass observer receives a kickback, and this reaction of the measuring device is not negligible in quantum theory because of the quantization of the action. Hence, the observer himself has to be included in the system that is being considered. A number of thought experiments involving finite mass observers which have quantum uncertainties in their time or in their position are discussed. The question of the covariance of the theory is analyzed for the case of more than one observer. Finally the electron paramagnetic resonance paradox is examined. Dissert. Abstr.

N82-13823 Northwestern Univ., Evanston, Ill.

ON THE RELATIONSHIP BETWEEN ANALYTICAL REGULARIZATION AND REGULARIZATION BY SURGERY Ph.D. Thesis

Kuang-Fu Tien 1981 57 p

Avail: Univ. Microfilms Order No. 8125024

The relationship between classical regularization and another topological method introduced by Easton called the regularization by surgery is examined. Analytical regularization is defined broadly enough to include all existing classical regularization and strengthen the concept of regularization by surgery. Naturally, we investigate first the relation of solution curves in M sub 2 and the solution curves in M sub 1. Then we obtain two theorems specifying conditions that an analytical regularization will imply regularization by surgery. The first theorem says that if the submanifolds in M sub 2 which are mapped to a single integral curve in M sub 1, form a smooth foliation of M sub 2, or a sufficiently large set in M sub 2 then the singularity in M sub 1 is regularizable by surgery. The second theorem expands the first theorem to allow a more complicated analytic regularization which still ensures regularization by surgery in M sub 1. These theorems are applied to the two body problem and restricted three body problem by using their classical analytical regularization respectively. Dissert. Abstr.

N82-13824 Rochester Univ., N. Y.

CURVATURE SINGULARITIES IN CERTAIN SPACE-TIMES Ph.D. Thesis

William J. DeAngelis 1981 106 p

Avail: Univ. Microfilms Order No. 8123973

Curvature singularities in certain space-times, in particular the notion of a strong curvature singularity, are discussed. Briefly,

an incomplete, inextendible timelike geodesic terminates in a strong curvature singularity if the volume elements for all synchronous coordinate systems along the geodesic have limiting values of zero as the singularity is approached. An infinitesimal test body in free fall would be crushed to zero volume as it approached a strong curvature singularity. It is shown that every timelike geodesic, which terminates at the Schwarzschild singularity, terminates in a strong curvature singularity. Further, certain timelike geodesics, which terminates at the Kerr singularity, terminate in a strong curvature singularity. Finally, it is shown that a null geodesic, whose tangent vector field represents a repeated principal null direction, can not terminate in a strong curvature singularity as defined by Tipler. Space-times containing such null geodesics, which in addition terminate at irremovable singularities, include the Schwarzschild, the Kerr, the Reissner-Nordstrom and the Kerr-Newman empty space solutions.
Dissert. Abstr.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N82-13825# Brookhaven National Lab., Upton, N. Y.
HAVE WE FOUND ASYMPTOPIA: THE ULTIMATE FORM OF PHYSICAL LAWS?
S. J. Lindenbaum 1981 25 p Presented at the 16th Rencontre de Moriond: Nonperturbative QCD; Theory and Expt., Les Arcs, France, 15-17 Mar. 1981 Prepared jointly with City Coll. of the City Univ. of New York
(Contract DE-AC02-76CH-00016; Grant NSF PHY-80-09788) (DE81-028853; BNL-29769; CONF-810376-4) Avail: NTIS HC A02/MF A01

The search for Asymptopia, a high energy region, is discussed. Asymptotia is where the ultimate form of physical laws are revealed all the way to infinite energy. T.M.

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N82-13826 Stanford Univ., Calif.
ACOUSTICAL SPECKLE INTERFEROMETRY AND APPLICATIONS IN EXPERIMENTAL MECHANICS Ph.D. Thesis
Mostafa Abbas Hamed 1981 114 p
Avail: Univ. Microfilms Order No. 8123417

When a continuous or pulsed wave of ultrasound is scanned over an object an echo emanating from the object may be detected. If the echo has an irregular variation in amplitude versus position of the sound source, the resulting variation is referred to as acoustical speckle. A theory of acoustical speckle interferometry is presented which parallels the data analysis in pointwise filtering in laser speckle interferometry. Displacement measurements were made utilizing the correlation of reference and displaced ultrasonic signals. Effects of strains and rotations on the minimum of the cross-correlation function are discussed by the illustration of theoretical and experimental examples. Dissert. Abstr.

N82-13827*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DETERMINATION OF TWO-STROKE ENGINE EXHAUST NOISE BY THE METHOD OF CHARACTERISTICS
A. D. Jones (Hills Industries, Clarence Gardens, South Australia) and G. L. Brown (California, Inst. of Technology, Pasadena) Jun. 1981 48 p refs Prepared in cooperation with Adelaide Univ., Australia
(NASA-TM-84061) Avail: NTIS HC A03/MF A01 CSCL 20A

A computational technique was developed for the method of characteristics solution of a one-dimensional flow in a duct as applied to the wave action in an engine exhaust system. By using the method, it was possible to compute the unsteady flow in both straight pipe and tuned expansion chamber exhaust systems as matched to the flow from the cylinder of a small two-stroke engine. The radiated exhaust noise was then determined by assuming monopole radiation from the tailpipe outlet. Very good agreement with experiment on an operation engine was achieved in the calculation of both the third octave radiated noise and the associated pressure cycles at several locations in the different exhaust systems. Of particular interest is the significance of nonlinear behavior which results in wave steepening and shock wave formation. The method computes the precise paths on the x-t plane of a finite number of C(sub +), C(sub -) and P characteristics, thereby obtaining high accuracy in determining the tailpipe outlet velocity and the radiated noise. Author

N82-13828*# Old Dominion Univ., Norfolk, Va. Dept. of Physics.
PROPAGATION OF SOUND THROUGH THE EARTH'S ATMOSPHERE Progress Report, 1 Jan. - 30 Jun. 1981
Roger Meredith, Francis Badavi, and Jacob Becher Aug. 1981 12 p refs
(Grant NAG1-142)
(NASA-CR-165008; PTR-81-12) Avail: NTIS HC A02/MF A01 CSCL 20A

Progress is reported in the development of hardware and software for an experiment to detect and measure sound transmission through air. For individual titles, see N82-13829 through N82-13830.

N82-13829*# Old Dominion Univ., Norfolk, Va.
MEASUREMENT OF SOUND ABSORPTION IN THE AIR
Roger Meredith, Francis Badavi, and Jacob Becher *In* Old Dominion Univ. Propagation of Sound Through the Earth's Atmosphere Aug. 1981 p 1-3 (For primary document see N82-13828 04-71)
Avail: NTIS HC A02/MF A01 CSCL 20A

The large temperature gradient in each section of the resonance tube resulting from the liquid nitrogen coolant necessitated a design modification to the cooling system. A timer and four solenoid valves were installed so that the coolant flow can be reversed periodically. The hardware and software for controlling the analog to digital converter and conversion rate were completed, and the system is operational. A duty cycle control circit was implemented so that on the sixteenth conversion a relay shuts off the vibration exciter used to generate the sound wave. Thus the starting point of each decay curve is exactly known. This information is necessary for evaluating the g digital decay information. The data acquisition and digital decay evaluation programs are described. A.R.H.

N82-13830*# Old Dominion Univ., Norfolk, Va.
DETECTION OF INFRASOUND GENERATED BY CLEAR AIR TURBULENCE (CAT)
Roger Meredith, Francis Badavi, and Jacob Becher *In* Old Dominion Univ. Propagation of Sound Through the Earth's Atmosphere Aug. 1981 p 3-10 refs (For primary document see N82-13828 04-71)
Avail: NTIS HC A02/MF A01 CSCL 20A

A unified data acquisiton system which is an AM carrier system consisting of a converter signal, conditioning electronics, and peripheral equipment was checked and calibrated and installed in a mobile van. A microphone array in the shape of a 244-m equilateral triangle was connected to the data acquisition system using 457-m long cables. Development of techniques for signal processing for interpreting the infrasonic signature (differentiating between CAT and other sources of infrasound) is summarized. Once patches of CAT are located in the atmosphere, corroboration can be achieved through test flights of aircraft into the suspected region. A.R.H.

N82-13831# Naval Postgraduate School, Monterey, Calif.
LABORATORY STUDY OF SOUND PROPAGATION INTO A FAST BOTTOM MEDIUM M.S. Thesis
James Arthur Bradshaw Jun. 1981 61 p refs
(AD-A104596) Avail: NTIS HC A04/MF A01 CSCL 20/1

The feasibility of a laboratory experiment to test an existing theoretical model describing sound propagation into a fast bottom

underlying a wedge shaped medium was investigated. Sand under fresh water was found to satisfy the constraints of the theoretical model and to simulate the continental shelf. In a laboratory, accuracy of density, sound speeds, and attenuation was shown to be sufficient to allow quantitative comparison to the prediction of the beam angle. Author

N82-13832# Naval Postgraduate School, Monterey, Calif.
ACOUSTIC BOUNDARY WAVE GENERATION AND SHADOWING AT A SEAMOUNT M.S. Thesis
Edgar Alvin Jordan Jun. 1981 97 p refs
(AD-A104594) Avail: NTIS HC A05/MF A01 CSCL 20/1

The interaction of a sound field and a seamount was studied by physically modeling the ocean surface over 2 dimensional and 3 dimensional models of Dickens Seamount. By using a smooth ocean surface, and one with a surface of scaled Rayleigh roughness to model a 35 knot wind, the relative contributions are determined for off-axis scattering elements, multiple reflection from the ocean surface, and diffraction over the crest of the seamount. Boundary wave generation over a randomly rough plane surface is studied experimentally. The ratio of boundary wave amplitude to volume wave amplitude is found to be proportional to (frequency) to the 3/2 power and (range) to the 1/2 power and the ratio of the empirical scattering parameters to the rms height of the roughness elements is found to be approximately 0.3. The spatial correlation length of the randomly rough surface takes the place of the center-to-center separation of the hemispherical bosses used in Tolstoy's theoretical treatment. Author

N82-13833# Texas Univ. at Arlington. Applied Research Lab.
THEORETICAL ANALYSIS OF THE EFFECTS OF TURBULENCE ON A MOBILE PARAMETRIC RECEIVER
C. Robert Culbertson 1 Apr. 1981 84 p refs
(Contract N00024-77-C-6200)
(AD-A101418; ARL-TR-81-19) Avail: NTIS HC A05/MF A01 CSCL 20/1

Development of analytical expressions that describe some effects of turbulence on the performance of a mobile parametric receiver are presented. Three general topics are covered: (1) summaries of literature pertaining to parametric reception, turbulence, and wave propagation in inhomogeneous media; (2) theoretical analysis; and (3) theoretical estimates of the effects of turbulence on parametric reception. It is concluded that turbulence can produce significant amplitude and phase fluctuations in the acoustic signal detected by the parametric receiver, but the experiments are required to determine the level of fluctuations that might be expected in a practical application. Author

N82-13834# Science Applications, Inc., McLean, Va.
MIXED LAYER DEPTH DISTRIBUTIONS FROM SVSTD DATA Technical Report, 24 Jun. - 22 Sep. 1980
Eugene Molinelli, John Donelson, and Linda Lilly Apr. 1981 114 p refs
(Contract N68463-80-C-0035)
(AD-A105669; SAI-81-260-WA; NOO-TR-271) Avail: NTIS HC A06/MF A01 CSCL 20/1

Mixed layer depths defined in terms of each of four parameters (temperature, sound speed, density and stability) are determined for an area in the northern North Atlantic. The distributions of the mixed layer depth are broken down by season (spring, summer and fall) and by area (Rockall Trough, Iceland Flank, Iceland-Faeroe Front). It is found that seasonal fluctuations in values of mixed layer depth are in excess of 40 meters (fall deeper than summer). Variation in the values of mixed layer depth by area are only about 10 m but are also significant. The Iceland Flank mixed layers are deeper than the Rockall Trough or the Iceland Faeroe Frontal Zone mixed layers. The stability definition is found to be faulty in its present form and an increase in the significant peak criteria from 2 to 3 cycles per hour is suggested. The Iceland-Faeroe Frontal Zone has greater deviation in MLDs which affect the different definitions of MLD in a complex manner. Author (GRA)

N82-13835# Rockwell International Corp., Columbus, Ohio. North American Aircraft Div.
INVESTIGATION OF ACOUSTIC INTERACTIONS IN JET THRUST AUGMENTING EJECTORS Final Report, 1 Jan. 1979 - 30 Sep. 1980
J. R. Campbell, K. D. Korkan (Ohio State Univ., Columbus), and H. Viets (Wright State Univ.) 5 Mar. 1981 244 p refs
(Contract N00019-79-C-0225)
(AD-A106083; NR80H-50) Avail: NTIS HC A11/MF A01 CSCL 20/1

The performance of a constant area rectangular ejector with varying mixing length was investigated to determine the aeroacoustic interaction effects. The rectangular ejector investigation was conducted in two phases. The phase one investigation involved the testing of three different aspect ratio rectangular convergent nozzles at pressures between 15-45 psig to determine the acoustic and jet spreading characteristics. From these data a rectangular ejector incorporating endwall and ejector flap blowing was fabricated and investigated at pressure ratios between 2.0 and 5.0. These investigations were conducted at ejector flap length (L) to ejector throat widths (W), L/W of 11.0, 9.5, 8.0, 6.5, 5.0, 3.5, 2.0, and 0.9 to determine the ejector performance. The data for the rectangular ejector configuration investigated showed an aeroacoustic interaction in the present ratio range of 3.3 - 3.8. However, the resulting performance was not improved to the degree experienced with axisymmetric ejectors. Author (GRA)

N82-13836# Illinois Univ., Urbana. Materials Research Lab.
ULTRASONIC ATTENUATION AND VELOCITY STUDIES IN THE ALPHA-ALPHA' SOLID SOLUTION PHASES OF THE Nb-H SYSTEM
F. M. Mazzolai and H. K. Birnbaum 1981 7 p refs Presented at the Intern. Conf. on Internal Friction and Acoustic Attenuation of Solids, Lausanne, Switzerland, Jun. 1981
(Contract DE-AC02-76ER-01198)
(DE81-026618; DOE/ER-01198/1357; CONF-8106105-1) Avail: NTIS HC A02/MF A01

Data are reported on the elastic constants and ultrasonic attenuation of a single crystal of Nb determined as a function of the hydrogen content ($0 < \text{or} = H/Nb < \text{or} = 0.71$) at 528 K and as a function of temperature ($380 < \text{or} = T < \text{or} = 528$ K) for $H/Nb = 0.31, 0.45, 0.53$, and 0.71. A relaxation process is observed which appears to be a Zener-type of effect. DOE

N82-13837# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Abt. Turbulenzforschung.
THE INFLUENCE OF PRESSURE WAVES ON MEASUREMENTS OF HIGH SPEED TRAIN NOISE
Dietrich Bechert Jul. 1980 94 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(DFVLR-FB-81-06) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 15,60

Pressure waves are studied experimentally and theoretically; their attenuation by high pass filters is calculated. Relative to an observer at rest, strong pressure fluctuations (pressure waves) are generated by high speed trains. Intensities are typically two orders of magnitude higher than those of radiated noise. Although this can cause problems when measuring noise close to the track, pressure waves can usually be filtered out as their major components are infrasonic. The analysis also includes effects due to vehicle shape and air compressibility. Examples are calculated and approximation formulas are given. Author (ESA)

N82-13838 Stanford Univ., Calif.
TRANSMISSION OF SOUND ACROSS A VORTEX LAYER ENCLOSING A CYLINDRICAL COLUMN OF JET Ph.D. Thesis
Raymond Ching Chung Luh 1981 141 p
Avail: Univ. Microfilms Order No. 812410

The transmitted sound field from an impulsive ring source inside an infinitely extending circular jet was investigated for both subsonic and supersonic jet speeds. The interface between the jet and the ambient medium at rest was idealized by a cylindrical vortex layer. Through the application of Fourier transform method, an approximate solution which includes the effects due to curvature was obtained for short waves. From

the stability analysis, it is shown that instability is no longer confined to M < 2 square root of 2, as predicted in the case of a plane vortex sheet, but may occur at all Mach numbers. However, the instability waves are wavelength dependent and cease to exist for long waves. A resonance wave present for M > 2 independent of wavelengths is shown to lead a sound field which will modify the specularly transmitted field in the region of its propagation. Dissert. Abstr.

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N82-13839 Pennsylvania State Univ., University Park.
OUTER-SHELL EXCITATION IN SPUTTERED ATOMS Ph.D. Thesis
Nihad A. Yusuf 1981 148 p
Avail: Univ. Microfilms Order No. 8120475

In order to gain some understanding of the excitation and ionization processes in sputtering, measurements of the absolute photon yield and the velocity distribution of the excited atoms were performed. Experimental results show that the photon yield is lower than the secondary ion yield. They also show that the velocities and threshold energies for excited particles are much higher than those of ground state particles. In addition, the population of upper levels was measured for various atomic transitions and results suggest the nonexistence of a local thermodynamic equilibrium inside a solid undergoing sputtering. Moreover, the high energies of the sputter excited atoms and the wide spread of these energies provide evidence against the existence of a local thermodynamic equilibrium. Based on these and other experimental observations such as the enhancement of both photon and secondary ion yields with oxygen, a unified model for excitation and ionization is proposed. This model is based on the level crossing concept in atomic collisions and it explains qualitatively the similarities and differences between photon and secondary ion emissions. Dissert. Abstr.

N82-13840 Purdue Univ., Lafayette, Ind.
TRANSITION RADIATION AS AN X-RAY SOURCE Ph.D. Thesis
Adam Ning Chu 1981 131 p
Avail: Univ. Microfilms Order No. 8124048

The design of a transition radiation X-ray source is described. Theoretical and physical optimizations to maximize the photon production in a given frequency bandwidth are presented. An optimization analysis accounting for material properties, multiple scattering, photon absorption, and statistical random errors in foil thicknesses is used to design an X-ray emitter. Three major experiments were performed to verify the derived design equations and a comparison is made to existing synchrotron, Bremsstrahlung, and electron bombardment X-ray sources. A comparison between a transition radiation X-ray source with synchrotron, Bremmstrahlung, and electron bombardment X-ray sources shows it to be highly competitive with unique advantages. Transition radiation can be generated by low energy linear accelerators, unlike synchrotron sources which need high energies and extremely high vacuum. Transition radiation is on par with synchrotron sources in brightness, but can also be designed for the very hard X-ray where no synchrotron source exists. Transition radiation is tunable, polarized and highly directional, unlike electron bombardment X-ray sources. Dissert. Abstr.

N82-13841 Nebraska Univ. - Lincoln.
INTERATOMIC POTENTIAL ENERGY HYPERSURFACES FOR MOLECULES Ph.D. Thesis
Robert Lee Vance 1981 158 p
Avail: Univ. Microfilms Order No. 8124525

Recent theoretical advances have placed the description of diatomic potential states (ground and excited) by highly accurate non-orthogonal multiconfiguration valence bond (MCVB) wave functions within reach. Techniques for efficiently handling double-zeta and polarization type basis functions for use in the MCVB wave functions are described. Specifically, an extensive ab initio MCVB calculation for the ground state of hydrogen fluoride is discussed. An efficient method for the modification of atomic orbital basis functions to describe the process of molecule formation is reported. Also, various configuration selection schemes for the MCVB wave function are discussed. Dissert. Abstr.

N82-13842 Wisconsin Univ. - Madison.
THE HADRONIC DECAY RATE OF THE HIGGS BOSON: AN APPLICATION OF THE RUNNING MASS Ph.D. Thesis
Eric Alan Braaten 1981 59 p
Avail: Univ. Microfilms Order No. 8117505

The decay rate of a heavy Higgs boson into a quark-antiquark pair is, in lowest order, proportional to the square of the quark mass. However, there are large quantum chromodynamic corrections to the decay rate in the form of logarithms of the Higgs-quark mass ratio. These logarithms can be absorbed into the quark mass, yielding the running mass evaluated at the scale of the Higgs mass. The size of the residual quantum chromodynamic corrections depends on the prescription for quark mass renormalization. The corrections are small if the running mass is defined so that, at the quark-antiquark threshold, it coincides with the pole in the quark propagator. Dissert. Abstr.

N82-13843 State Univ. of New York, Stony Brook.
ULTRAVIOLET STRUCTURE OF SUPERSYMMETRIC NON-LINEAR SIGMA-MODELS Ph.D. Thesis
Gaume Luis Alvarez 1981 192 p
Avail: Univ. Microfilms Order No. 8118956

The applications of differential geometry to the general supersymmetric nonlinear sigma-meson model on two space-time dimensions are considered. An adequate perturbation theory for these models is constructed. This is obtained using the background field expansion combined with the normal coordinate expansion. The characterization and classification of all possible Fermi-Bose symmetries which appear in two space-time dimensions are discussed in the framework of nonlinear sigma-meson models. It is proved that fermionic symmetries require necessarily the existence of complex structures on the manifold where the theory is defined. The proof is based on the theory of complex manifolds and holonomy groups. As a consequence of the characterization theorem and the background field methods, general criteria are given which determine what kind of counterterms will cancel the ultraviolet divergences of the S-matrix. Dissert. Abstr.

N82-13844 Nebraska Univ. - Lincoln.
SCHWINGER'S VARIATIONAL PRINCIPLE FOR ELECTRON-ION SCATTERING Ph.D. Thesis
Nasser Maleki 1981 239 p
Avail: Univ. Microfilms Order No. 8124517

The principle is formulated for electronion (atom) collision using the coulomb (free particle) Green's function. The theory was applied to a screened coulomb potential as well as e(-) He(+) and e(-)H to obtain analytic distorted waves, phase shifts, and quantum defects for energies near the ionization threshold. A numerical technique of calculating the phase shifts and wave functions is also outlined. Dissert. Abstr.

N82-13845 State Univ. of New York at Albany.
RELATIVISTIC MANY-BODY PERTURBATION THEORY OF PARITY-VIOLATION IN ATOMS Ph.D. Thesis
Bhanu Pratap Das 1981 108 p
Avail: Univ. Microfilms Order No. 8122253

The Weinberg-Salam model is the simplest of all the gauge models that attempt to unity electromagnetic and weak interactions. This model predicts the existence of a parity-violating neutral weak interaction between the particles, electrons, protons and neutrons which make up an atom. Experiments based on optical rotation and circular dichroism were carried out on bismuth, thallium and caesium to detect parity violation in these atoms. The relativistic many-body perturbation theory was employed to study circular dichroism for the 6s sub 1/2 yields 7s sub 1/2 transition in atomic caesium and 6p sub 1/2 yields 7p sub 1/2 transition in atomic thallium. Dissert. Abstr.

N82-13846 Northwestern Univ., Evanston, Ill.
PHYSICAL ADSORPTION OF QUANTUM ATOMIC AND MOLECULAR SYSTEMS Ph.D. Thesis

Sujane Chang Wang 1981 102 p
Avail: Univ. Microfilms Order No. 8125034

Using the variational method proposed by Lowy and Woo, the ground-state energies of the 1/3- and 1/4-coverage superlattices of He sub 4 physisorbed on graphite are calculated. Properly symmetrized single-particle factors in the trial wave function are constructed from expansions in an orthogonal basis set hose elements are the eigenfunctions of a Hamiltonian with a laterally averaged substrate potential. Calculation of the energy of the He sub 4 monolayer in the liquid phase is then carried out in a manner consistent with the superlattice calculation. The 1/3-coverage superlattice is found to be stable, while the 1/4-coverage monolayer chooses to remain in the liquid phase. The physisorption of hydrogen molecules is then investigated in search for quantum liquid crystals. 'Quantum liquid crystals' are quantum liquids which exhibit macroscopic orientational order but no (or partial) spatial order. Ortho-hydrogen molecules are light enough so that even at very low temperatures the zero-point motion of the molcules keeps the system in the liquid state. The molecules are anisotropic and the interaction orientation dependent, so it is not impossible for macroscopic orientational order to arise under appropriate conditions. Dissert. Abstr.

N82-13847 North Carolina State Univ. at Raleigh.
DOUBLE DIFFERENTIAL CONTINUUM NEUTRON SCATTERING CROSS SECTIONS IN IRON AND NICKEL FOR INCIDENT ENERGIES OF 7.5, 10 AND 12 MeV Ph.D Thesis
Albert George Beyerle, Jr. 1981 147 p
Avail: Univ. Microfilms Order No. 8121710

Double differential neutron inelastic scattering cross sections exciting high-lying levels in iron and nickel for incident neutron energies of 7.5, 10, and 12 MeV were measured. Outgoing neutron energy distributions or neutron energies above 0.5 MeV up to about 2 MeV below the incident neutron energy, and scattered neutron angular distributions at up to 5 scattering angles between 45 and 145 deg were measured. These measurement were made using time-of-flight techniques on the neutron scattering facility that has been developed at TUNL. Further attempts to isolate the effects of the scattering cross section are made computationally by a large Monte Carlo type simulation of the experiment. The computed corrections include finite geometry, attenuation, non-monoenergetic source, multiple scattering, and other effects which cannot effectively be removed experimentally. Dissert. Abstr.

N82-13848 Northwestern Univ., Evanston, Ill.
INCLUSIVE CHARGED PARTICLE SPECTRUM FROM THE INTERACTION OF NUCLEI WITH INTERMEDIATE ENERGY PROTON Ph.D. Thesis
Tsewei Chen 1981 251 p
Avail: Univ. Microfilms Order No. 8124865

The nuclear interactions were investigated systematically at the intermediate bombarding energies between 80 Mev and 164 Mev using targets that span the periodic table. Both charged particles and gamma-ray spectra were studied in order to examine the two quite different mechanisms of the interaction, namely, intranuclear cascade and evaporation interactions. It is observed that while fast cascade charged particles are strongly forward peaking the evaporation particles are near isotropic for proton, deutron and alphas. Fast spectrum of the same particle are similar for all the targets studied which indicates the same fast interaction mechanism can apply to all targets. Mass and charge distributions from gamma-ray spectra showed that only one or two of particles are emitted in the cascade stage and most of the incident energy is taken away by the fast nucleons. Finally, two theoretical models, namely cascade and exciton models, were discussed. Comparison between experimental data and model calculation were made. While they both well reproduced the observed data some serious disadvantages exist for both of the models.
Dissert. Abstr.

N82-13849 Georgia Inst. of Tech., Atlanta.
ANALYSIS OF COUPLED TRANSLATIONAL AND ROTATIONAL DIFFUSION USING OPERATOR CALCULUS Ph.D. Thesis
Ulrich Robert Steiger 1981 157 p
Avail: Univ. Microfilms Order No. 8124501

The equations for coupled translational and rotational diffusion of asymmetric molecules immersed in a fluid are obtained. The method used begins with the Kramers-Liouville equation and leads to the generalized Smoluchowski equation for diffuion in the presence of potentials. Both external potentials and intermolecular potentials are considered. The contraction of the description from the Kramers-Liouville equation to the Smoluchowski equation is achieved by using a combination of operator calculus and cumulants. Explicit solutions of these equations are obtained in the two-dimensional case. The formalism also allows the calculation of corrections be be generalzied Smoluchowski equation. Smoluchowski's result is precisely the second cumulant, in the cumulant expansion. Dissert. Abstr.

N82-13850# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
GAS TARGET NEUTRON GENERATOR STUDIES
Vijay Chatoorgoon Oct. 1981 152 p refs
(UTIAS-251; CN-ISSN-0082-5255) Avail: NTIS HC A08/MF A01

Heat deposition in a subsonic flow can cause the formation of gas density gradients which constitute useful gas targets. The variation of beam voltage, gas density, gas pressure, gas temperature, etc., within a subsonic channel were calculated as a function of the system parameters: beam voltage, beam current, channel diameter, stagnation tank temperature and pressure. The analysis is presented as applicable to any combination of beam particle and target gas. It was found that the subsonic gas target (SGT) is stable against all small perturbations and against certain types of large perturbations. The closely-related transonic gas target (TGT) appears to be unstable to all perturbations. Comparison of hypersonic, transonic, and subsonic gas targets shows that the SGT is the most advantageous type and operates at a lower mass flow and at less severe stagnation tank conditions than the TGT or HGT. The problem of a deuterium spill into the tritium port of a straight hypersonic target was also investigated.
A.R.H.

N82-13851*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ADAPTATION OF THE TH EPSILON MU FORMALISM FOR THE ANALYSIS OF THE EQUIVALENCE PRINCIPLE IN THE PRESENCE OF THE WEAK AND ELECTROWEAK INTERACTION
A. J. Fennelly (Western Kentucky Univ.) Oct. 1981 40 p refs
(NASA-TM-82450) Avail: NTIS HC A03/MF A01 CSCL 20H

The TH epsilon mu formalism, used in analyzing equivalence principle experiments of metric and nonmetric gravity theories, is adapted to the description of the electroweak interaction using the Weinberg-Salam unified SU(2) x U(1) model. The use of the TH epsilon mu formalism is thereby extended to the weak interactions, showing how the gravitational field affects W sub mu (+ or -1) and Z sub mu (0) boson propagation and the rates of interactions mediated by them. The possibility of a similar extension to the strong interactions via SU(5) grand unified theories is briefly discussed. Also, using the effects of the potentials on the baryon and lepton wave functions, the effects of gravity on transition mediated in high-A atoms which are electromagnetically forbidden. Three possible experiments to test the equivalence principle in the presence of the weak interactions, which are technologically feasible, are then briefly outline: (1) K-capture by the FE nucleus (counting the emitted X-ray); (2) forbidden absorption transitions in high-A atoms' vapor; and (3) counting the relative Beta-decay rates in a suitable alpha-beta decay chain, assuming the strong interactions obey the equivalence principle.
Author

N82-13852# Naval Research Lab., Washington, D. C. Plasma Physics Div.
STABILITY CONSIDERATIONS FOR LIGHT-ION BEAM TRANSPORT IN Z DISCHARGE CHANNELS Interim Report
P. F. Ottinger, D. Mosher, and Shyke A. Goldstein 8 Jul. 1981 25 p refs Prepared in cooperation with JAYCOR, Alexandria, Va.
(Contract DE-AI08-79DP-40092)
(AD-A101426; NRL-MR-4548) Avail: NTIS

HC A02/MF A01 CSCL 20/8

Light ion beams, appropriate for use as inertial confinement fusion drivers, are transported in z discharge channels over distance of several meters. Stability considerations for light ion beam transport in such channels are reviewed. The important velocity space instabilities are considered and the resulting conditions for good transport are discussed. The results are presented in a general form so that they may be applied to beams of various species (e.g., H(+), D(+), and C(+4) propagating in channel plasmas of different composition (e.g., hydrogen, argon, air, etc.). Author

N82-13853# Los Alamos Scientific Lab., N. Mex.

MOLECULAR DYNAMICS CALCULATIONS FOR SODIUM USING PSEUDOPOTENTIAL THEORY

R. E. Swanson Jun. 1981 185 p refs

(Contract W-7405-eng-36)

(DE81-029022; LA-8877-T) Avail: NTIS HC A09/MF A01

The equation of state of sodium is studied using the molecular dynamics technique whereby the classical motion of a system of ions is solved with the aid of computers. The interaction potential between pairs of sodium ions consists of Coulomb and Born-Mayer repulsion terms and an effective ion-ion interaction derived from pseudopotential theory. This theory includes the effects of electron gas screening, exchange, and correlation. A model pseudopotential with parameters fit to experimental low-temperature data is used. By using this technique, an atomic description of a simple metal proceeds to the calculation of macroscopic thermodynamic properties. DOE

N82-13854# California Univ., Livermore. Lawrence Livermore Lab.

POSITRON LIFETIME AND DOPPLER BROADENING TECHNIQUES APPLIED TO IRRADIATION DAMAGED SILVER

R. H. Howell 27 Jul. 1981 12 p refs Presented at Am. Inst. of Metallurgical Engr. Meeting, Las Vegas, Nev., Feb. 1980

(Contract W-7405-eng-48)

(DE81-028688; UCRL-83050; CONF-800205-16) Avail: NTIS HC A02/MF A01

Positron lifetime and Doppler broadening measurements was used to study defect production resulting from room temperature irradiation of pure silver by D-T fusion neutrons or energetic protons. Use of the positron annihilation analysis established that the surviving defects from both irradiations have the same dose dependence and that defect concentration can be quantitatively measured and compared to damage models. The relative merit of the lifetime and Doppler broadening measurements in arriving at these conclusions is discussed along with some practical aspect of the measurements. In the proton damaged samples the trapping rate approaches saturation, a circumstance which could be misinterpreted if a less extensive data set containing only Doppler broadening data were available. Some remarks about the analysis of positron data and general conclusion about the defect structure are given. DOE

N82-13855# Oak Ridge National Lab., Tenn.

BACKGROUND FITTING FOR ELECTRON ENERGY-LOSS SPECTRA

J. Bentley, G. L. Lehman, and P. S. Sklad 1981 8 p refs Presented at the 3rd Anal. Electron Microscopy Workshop, Vail, Colo., 13 Jul. 1981

(Contract W-7405-eng-26)

(DE81-027117; CONF-810740-1) Avail: NTIS HC A02/MF A01

Background subtraction methods for microanalysis using electron energy loss spectroscopy are examined. In order to assess true edge profiles and obtain integrated intensities of the inner shell ionization edge of interest, it is first necessary to substract the background. Usually a simple inverse power law is used, but for some spectra this form does not fit well. An alternative form which results in superior fits is described. DOE

N82-13856# Brookhaven National Lab., Upton, N. Y. Dept. of Chemistry.

MECHANISTIC STUDIES OF ELECTRON EXCHANGE KINETICS USING AB INITIO

Marshall D. Newton 1981 25 p refs Presented at the Conf. on Inorganic Reaction Mech., Detroit, 10 Jun. 1981 Submitted for publication

(Contract DE-AC02-76CH-00016)

(DE81-026096; BNL-29896; CONF-8106139-2) Avail: NTIS HC A02/MF A01

The rate constant for the aqueous Fe2(+)-Fe3(+) electron exchange reaction is calculated. The effective contact distance (r sub min) is taken as 5.5 A, the value at which the staggered face-to-face configuration of the orthohedral complexes achieves van der waals contact. The electronic coupling information implicit K sub el(r) is obtained from large scale ab initio molecular orbital calculations carried out for the diabatic states of the reactive ion pair. The calculated rate constant K sub ex, and associated activation parameters are in good agreement with experimental data extrapolated to zero ionic strength and correspond to a mechanism dominated by direct Fe-Fe overlap and characterized by a modest degree of nuclear tunneling and non-adiabatic character. DOE

N82-13857# California Univ., Livermore. Lawrence Livermore Lab.

ROLE OF MOLECULAR DYNAMICS ON DESCRIPTIONS OF SHOCK FRONT PROCESSES

Arnold M. Karo 22 Jul. 1981 17 p refs Presented at the Workshop on the Chem. of Shock Compression, Palo Alto, Calif., 22 Jun. 1981

(Contract W-7405-eng-48)

(DE81-028687; UCRL-86489; CONF-810684-45) Avail: NTIS HC A02/MF A01

A computational approach, based on classical molecular dynamics, is used to form a realistic picture of shock induced processes occurring at the shock front and resulting from the detailed, violent motion associated with shock motion on an atomic scale. Prototype studies of phase transitions are discussed. The interaction of the shock front with defects, surfaces, voids, and inclusions, and across grain boundaries are summarized. The critical question of how mechanical energy imparted to a condensed material by shock loading is converted to the activation energy required to overcome some initial energy barrier in an initiation process, is addressed. DOE

N82-13858# Stanford Linear Accelerator Center, Calif.

TWO-PHOTON PHYSICS AS A PROBE OF HADRON DYNAMICS

Stanley J. Brodsky May 1981 21 p refs Presented at the 4th Intern. Colloq. on Photo-Photon Interactions, Paris, 6-9 Aug. 1981

(Contract DE-AC03-76SF-00515)

(DE81-028757; SLAC-PUB-2747; CONF-810496-2) Avail: NTIS HC A02/MF A01

Two-photon collisions are used to test many features of quantum chromodynamics, especially the interplay between the vector-meson-dominated and point-like hadronic interactions of the photon. A number of QCD applications are discussed, including: jet and single-particle production at large transverse momentum; the photon structure function and its relationship to the gama yields q anti q wave function; and the possible role of gluonium states in the gamma gamma yields rho rho channel. Evidence that even low momentum transfer photon-hadron interactions are sensitive to the point-like gamma yields q anti q coupling is discussed. DOE

N82-13859# Texas A&M Univ., College Station.

STUDY OF THE NEUTRON-PROTON INTERACTION IN THE 300-700 MeV ENERGY REGION Annual Progress Report

L. C. Northcliffe 1981 41 p refs

(Contracts DE-AS05-76ER-04449; E(40-1)-4449)

(DE81-026733; DOE/ER-04449/34) Avail: NTIS HC A03/MF A01

Research investigating nucleon-nucleon interactions in both elastic and inelastic channels at LAMPF energies was performed in cooperation with Los Alamos National Laboratory personnel. A summary is given of the experimental apparatus an method, and results obtained for neutron-proton interactions. DOE

N82-13860# Oak Ridge National Lab., Tenn. Health and Safety Research Div.

ENERGY LOSSES AND MEAN FREE PATHS OF ELECTRONS

IN SILICON DIOXIDE

J. C. Ashley and V. E. Anderson 1981 21 p refs Presented at the IEEE Conf. on Nucl. Sci. and Space Radiation, Seattle, 21 Jul. 1981

(Contract W-7405-eng-26)

(DE81-026353; CONF-810707-6) Avail: NTIS HC A02/MF A01

Theoretical models and calculations are combined with experimental optical data to determine a model energy-loss function for SiO2. Sumrule checks and comparisons with experimental information are made to insure overall consistency of the model. The model energy-loss function is employed to calculate electron inelastic mean free paths and stopping powers for electrons with energies < or = 10 keV in SiO2. DOE

N82-13861# Los Alamos Scientific Lab., N. Mex.

ENHANCED ENERGY DEPOSITION SYMMETRY BY HOT ELECTRON TRANSPORT

D. Wilson, J. Mack, E. Stover, D. VanHulsteyn, G. McCall, and A. Hauer 1981 16 p ref Presented at the Symmetry Aspects of Inertial Fusion Implosions Topical Conf., Washington, D.C., 27 May 1981

(Contract W-7405-eng-36)

(DE81-028774; LA-UR-81-2141; CONF-810576-2) Avail: NTIS HC A02/MF A01

High energy electrons produced by resonance absorption carry the CO2 laser energy absorbed in a laser fusion pellet. The symmetrization that can be achieved by lateral transport of the hot electrons as they deposit their energy is discussed. A K sub alpha experiment shows a surprising symmetrization of energy deposition achieved by adding a thin layer of plastic to a copper sphere. Efforts to numerically model this effect are described. DOE

N82-13862# California Univ., Livermore. Lawrence Livermore Lab.

BEAM PROPAGATION IN THE FREQUENCY-CONVERTED SUBSYSTEMS OF NOVA AND NOVETTE

J. Hunt, W. Simmon, R. Speck, W. Warren, and D. Eimerl 7 Jul. 1981 36 p

(Contract W-7405-eng-48)

(DE81-028253; UCID-19086) Avail: NTIS HC A03/MF A01

It is shown that the nonlinear growth of beam modulation produced by self-focusing is proportional 1/2 exp B where B is the intensity dependent phase retardation (measured in radians) accumulated by the beam. This exponential growth of beam modulation in the baseline frequency conversion/focusing optical train limits the system performance for short pulse (tau less 2 ns), one third micron operation. One micron and one-half micron performance are limited more by the one micron drive available to frequency conversion KDP array than self-focusing. DOE

N82-13863# Oak Ridge National Lab., Tenn.

SPECIFIC GAMMA-RAY DOSE CONSTANTS FOR NUCLIDES IMPORTANT TO DOSIMETRY AND RADIOLOGICAL ASSESSMENT

Laurie M. Unger and D. K. Trubey Sep. 1981 76 p refs

(Contract W-7405-eng-26)

(DE81-031980; ORNL/RSIC-45) Avail: NTIS HC A05/MF A01

Tables of specific gamma-ray dose constants (the unshielded gamma-ray dose equivalent rate at 1 m from a point source) were computed for approximately 500 nuclides important to dosimetry and radiological assessment. The half life, the mean attenuation coefficient, and thickness for a lead shield providing 95 percent dose equivalent attenuation are also listed. DOE

N82-13864# Joint Research Centre of the European Communities, Ispra (Italy).

GAMMA RAY BUILDUP FACTORS IN LEAD-IRON AND IRON-LEAD SHIELDS

H. Penkuhn 1980 22 p refs Submitted for publication

(EUR-7086-EN) Avail: NTIS HC A02/MF A01

Using the gamma transport code PIPE, buildup factors are evaluated in shields consisting of: iron layers of up to 40 cm thickness followed by thick lead layers; and lead layers of up to 10 cm thickness followed by thick iron layers. The source is assumed plane isotropic and four source energies were used, ranging from 0.66 MeV (caesium source) to 6 MeV. The differences between the buildup factors for exposure and equivalent dose rates are outlined. A comparison of the buildup factors in the iron-lead sequence and the lead-iron sequence shows the latter configuration to present fewer problems. Author (ESA)

N82-13865 Northwestern Univ., Evanston, Ill.

ON THE VIBRATIONAL ENERGY TRANSFER PROCESSES OF POLYATOMIC MOLECULES IN THE GAS AND SOLID PHASES Ph.D. Thesis

Vartkess Ara Apkarian 1981 292 p

Avail: Univ. Microfilms Order No. 8124844

Vibrational energy transfer has been studied experimentally, both in the gas and solid phases, with the aim of obtaining a description of the equilibration pathways in multimodes systems and obtaining specific state-to-state rate constants. The experimental results are compared with theoretical models in an attempt to understand the dynamics underlying the exchange of energy among the different degrees of freedom of two interacting systems. The experimental method used in these studies is that of laser induced fluorescence. It is shown that a detailed kinetic treatment is essential for extracting state-to-state rate constants from the experimental observables. Thus the general kinetic problem of vibrational equilibration of a multimode system is considered in some detail. Some mathematical and experimental techniques are intoduced for the reduction of experimental data. Dissert. Abstr.

N82-13866 Georgia Univ., Athens.

THEORY AND CALCULATION OF RAMAN LINE SHAPES AND EXCITATION PROFILES NEAR A ONE PHOTON RESONANCE Ph.D. Thesis

Don Alan Berkowitz 1981 212 p

Avail: Univ. Microfilms Order No. 8123034

The dependence of the crossing angle between two beams of coherent radiation in a coherent anti-stokes Raman Spectroscopy (CARS) experiment on the frequency difference between the beams was determined through consideration of the geometry involved and the dependence of index of refrction on frequency. Closed-form expressions were developed for overlap integrals essential to the calculation of spectral intensities in absorbance, fluorescence, Raman, and CARS spectra, Overlap integrals were calculated for harmonic oscillator wavefunctions, in which the ground and excited state potential functions were not necessarily equal in frequency. Closed-form expressions of overlap integrals were derived for the treatment of Morse potential functions in the ground and excited state. A least squares fitting routine was developed to determine values of moleclar parameters from analysis of spectra and excitation profiles. Dissert. Abstr.

N82-13867 Rochester Univ., N. Y.

MOLECULAR BEAM ELECTRIC RESONANCE STUDIES OF WEAKLY BOUND COMPLEXES Ph.D. Thesis

Robert L. DeLeon 1981 135 p

Avail: Univ. Microfilms Order No. 8123974

Van der Waals molecules composed of an argon atom weakly bound to variety of small molecules are studied. Seeded supersonic nozzle beam expansions were employed in a molecular beam electric resonance spectrometer to study electric dipol transitions both in the presence and absence of an external electric field. Rotational spectra were used to derive rotational constants and structural parameters, including R and theta on all species. R is defined as the distance between the monomer center of mass and the argon and theta is the angle between R and the monomer symmetry axis. Where possible hyperfine parameters, dipole moments, centrifugal distortion constants, force constants, vibrational frequencies, inversion splittings and inversion barriers were obtained. Weakly bound complexes of sulfur dioxide with a large number of molecular species were formed in nozzle expansions and studied mass spectroscopically. The electrostatic deflection of some of these species was observed.Dissert. Abstr.

N82-13868 Iowa State Univ. of Science and Technology, Ames.

A COMPARATIVE STUDY OF CLASSICAL AND QUANTAL APPROACHES TO THERMAL AND DIFFUSIVE TRANSPORT IN A DILUTE ATOM-DIATOM BINARY MIXTURE Ph.D. Thesis

David Russell Evans 1981 334 p
Avail: Univ. Microfilms Order No. 8123123

A parallel derivation of the Boltzmann equation in both classical and quantum mechanics is given. In particular, a quantal form which closely resembles the classical form is obtained. The kinetic theory appropriate to the thermal conductivity, thermal diffusion, and diffusion coefficients is given in both classical and quantum mechanics for an atom and diamagnetic diatom (more generally, a linear molecule) mixture in an applied magnetic field. Explicit expressions for energy dependent, and thermally averaged cross sections are obtained. A study of the effect of chattering collisions on various thermally averaged cross sections is given for a rigid potential. It is found that some cross sections are more strongly effected than others. In particular, those cross sections which are related by energy conservation are most strongly affected. The applicability of a rigid interaction as a control variate in a Monte Carlo study of a realistic interaction is discussed in light of these results. Dissert. Abstr.

N82-13869 Florida Univ., Gainesville.
A CORRELATED TREATMENT OF BOUND-CONTINUUM TRANSITIONS WITHIN THE ELECTRON PROPAGATOR FORMALISM Ph.D. Thesis
Manoj Kumar Mishra 1981 93 p
Avail: Univ. Microfilms Order No. 8124445

A super-operator formulation for decoupling the symmetry blocks of the full 2p-h TDA electron propagator matrix is presented. The accuracy of this decoupling was explored by using the full 2p-h TDA overlap amplitudes to calculate relative ionization intensities for N2 and H2O. The effect of excluding orbitals on the calculated ionization potentials and relative ionization cross-sections is reported. The use of intensities obtained from successively larger subsets for labeling the photo-electron spectrum is suggested. Expressions were formulated for the correlated treatment of photoionization cross-sections using Feynman-Dyson amplitudes of the electron propagator to describe the ionization processes and an orthogonalized plane wave description for the photoelectron. Explicit equations were derived for the theoretical treatment of experimental cross-sections using either spherical grid deflection type spectrometers or those using a particular collection angle. Dissert. Abstr.

N82-13870 Georgia Inst. of Tech., Atlanta.
TRANSPORT PROPERTIES OF GASEOUS IONS Ph.D. Thesis
Michael Gordon Thackston 1981 171 p
Avail: Univ. Microfilms Order No. 8124298

The mobilities and longitudinal diffusion coefficients of positive alkali and negative halogen ions in a variety of gases were measured as functions of the ratio of the electric field strength to the neutral gas number density. Thirty-one ion-gas combinations were studied using a drift tube mass spectrometer of ultra-high vacuum construction. Bursts of ions were repetitively gated into the drift region which contained the neutral gas at a constant, predetermined pressure. After drifting a known distance, the ions were mass selected and then detected. The arrival times of the ions were recorded with the aid of a 256-channel time of flight analyzer, and the resulting arrival time histograms were used to determine the mobilities and longitudinal diffusion coefficients of the ions in the neutral gas. A rigorous kinetic theory of ion mobility was discussed. Dissert. Abstr.

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N82-13871# Oak Ridge National Lab., Tenn.
HIGH-TEMPERATURE GAS-COOLED REACTOR TECHNOLOGY DEVELOPMENT PROGRAM Annual Progress Report, period ending 31 Dec. 1980
Paul R. Kasten Aug. 1981 332 p refs
(Contract W-7405-eng-26)
(DE81-029096; ORNL-5753) Avail: NTIS HC A15/MF A01

Research activities are described concerning HTGR chemistry; fueled graphite development; prestressed concrete pressure vessel development; structural materials; HTGR graphite studies; HTR core evaluation; reactor physics; shielding; application and project assessments; and HTR Core Flow Test Loop studies. DOE

N82-13872# Ohio State Univ., Columbus. Dept. of Physics.
PATTERN OF NEUTRINO MIXING IN GRAND UNIFIED THEORIES
K. Milton and K. Tanaka 1981 9 p refs
(Contracts DE-AC02-76ER-01545; EY-76-C-02-1545)
(DE81-029034; DOE/ER-01545/309) Avail: NTIS HC A02/MF A01

It was found previously in SO(10) grand unified theories that if the neutrinos have a Dirac mass and a right-handed Majorana mass (approximately 10 to the 15th power GeV) but no left-handed Majorana mass, there is small electron neutrino/sub e/ mixing but muon neutrinos - neutrino sub tau mixing can be substantial. This problem is reexamined on the basis of a formalism that assumes that the up, down, lepton, and neutrino mass matrices arise from a single complex 10 and a single 126 Higgs boson. This formalism determines the Majorana mass matrix in terms of quark mass matrices. Adopting three different sets of quark mass matrices that produce acceptable fermion ass ratios and Cabbibo mixing produces results consistent with the above; however, in the optimum case electron neutrino - muon neutrino mixing can be of the order of the Cabbibo angle. DOE

N82-13873# Oak Ridge National Lab., Tenn. Computer Sciences Div.
HETFIS: HIGH-ENERGY NUCLEON-MESON TRANSPORT CODE WITH FISSION
J. Barish, T. A. Gabriel, F. S. Alsmiller, and R. G. Alsmiller, Jr. Jul. 1981 29 p refs
(Contract W-7405-eng-26)
(DE81-027674; ORNL/TM-7882) Avail: NTIS HC A03/MF A01

A model that includes fission for predicting particle production spectra from medium-energy nucleon and pion collisions with nuclei (Z > or = 91) has been incorporated into the nucleon-meson transport code, HETC. The programming aspects of HETFIS (High-Energy Nucleon-Meson Transport Code with Fission) are presented. A description of the program data and instructions for operating the code are given. HETFIS is written in FORTRAN 4 for the IBM computers and is readily adaptable to other systems. DOE

N82-13874 Rochester Univ., N. Y.
INELASTIC SCATTERING OF HIGH ENERGY MUONS FROM NUCLEAR TARGETS
Martin Thomas Miller 1981 148 p
Avail: Univ. Microfilms Order No. 8123992

The inelastic cross section of high energy muons from nuclear targets were measured. It was performed using a 10.5 GeV muon beam and a system of multiwire proportional chambers. The range of $0.2 < Q(2) < 2.4(GeV/c)(2)$ and $1 < NU < 9$ GeV was explored and it was found that in most cases muons scatter incoherently from the individual nucleons in the nucleus. However, for a small fraction of the events the nucleons shadow one another resulting in a cross section sigma sub T is approximately sigma sub NA rho where A is the atomic number of the nuclear target and $0.9 < RHO < 1.0$. This 'shadowing' effect is attributed to the strongly interacting component of the exchanged virtual photon and its magnitude was found to be in excess of the predictions of current theoretical models. B.W.

74 OPTICS

Includes light phenomena.

N82-13875 Rochester Univ., N. Y.
PHASE MEASUREMENTS IN THE REGION OF AN ABERRATED LENS Ph.D. Thesis
Joel Leo Seligson 1981 245 p
Avail: Univ. Microfilms Order No. 8124003

The intensity and phase distributons in the focal region of an aberrated lens were studied both theoretically and experimentally. For computing the intensity and phase distributions, three methods the Nijboer-Zernike method, the asymptotic method and the discrete Fourier transform were compared. The discrete Fourier transform was found to be the most useful method for treating a wide range of aberrated lenses. The intensity and phase distributions were computed for a variety of theoretical lenses. It was observed that in some cases the phase distribution is a much more sensitive indicator of the presence of aberrations than the intensity distribution. It is found that phase measurements provide a very accurate method for locating the zero points of the intensity due to the multivaluedness exhibited by phase around these points. Dissert. Abstr.

N82-13876*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INFRARED EXPERIMENTS FOR SPACEBORNE PLANETARY ATMOSPHERES RESEARCH. FULL REPORT
Nov. 1981 150 p refs
(Contract NAS7-100)
(NASA-TM-84414) Avail: NTIS HC A07/MF A01 CSCL 20F

The role of infrared sensing in atmospheric science is discussed and existing infrared measurement techniques are reviewed. Proposed techniques for measuring planetary atmospheres are criticized and recommended instrument developments for spaceborne investigations are summarized for the following phenomena: global and local radiative budget; radiative flux profiles; winds; temperature; pressure; transient and marginal atmospheres; planetary rotation and global atmospheric activity; abundances of stable constituents; vertical, lateral, and temporal distribution of abundances; composition of clouds and aerosols; radiative properties of clouds and aerosols; cloud microstructure; cloud macrostructure; and non-LTE phenomena. A.R.H.

N82-13877*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INFRARED EXPERIMENTS FOR SPACEBORNE PLANETARY ATMOSPHERES RESEARCH. EXECUTIVE SUMMARY
Nov. 1981 13 p
(Contract NAS7-100)
(NASA-TM-84413) Avail: NTIS HC A02/MF A01 CSCL 20F

The role of 0.5 to 300 micron remote sensing in planetary atmospheres exploration was evaluated by examining a broad range of measurement techniques including quantitative intercomparisons of existing and planned instruments by the phenomenological method. Key areas of infrared instrumentation requiring development for the investigations of atmospheres were identified. A.R.H.

N82-13878# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
EVALUATION OF HALO DECONVOLUTION SCHEMES Final Technical Report, Nov. 1978 - Nov. 1980
Richard Barakat Jul. 1981 133 p refs
(Contract F30602-79-C-0018; ARPA Order 3655)
(AD-A105125; RADC-TR-81-196) Avail: NTIS HC A07/MF A01 CSCL 20/6

The final report chronicles various aspects of the research conducted by the principal investigator on the wavefront deconvolution problem. Only work carried out since the interim report RADC-TR-80-154, May 1980, was released is discussed because the material in the interim report is complete in itself. The work discussed here naturally forms four major interrelated, but separate research items, and each topic is the subject of a separate section of the final report. In addition, there is an appendix devoted to a minor item which evolved during the course of the investigation but is not directly related to the major items. Author (GRA)

N82-13879# Purdue Univ., Lafayette, Ind. Center for Information and Numerical Data Analysis and Synthesis.
CRITICALLY EVALUATED DATA ON OPTICAL AND TRANSPORT PROPERTIES OF SOLIDS (REFRACTIVE INDEX AND ABSORPTION COEFFICIENT OF SELECTED OPTICAL MATERIALS) Final Technical Report, 1 May 1976 - 30 Apr. 1981
H. H. Li 4 Jun. 1981 25 p refs
(Contract F44620-76-C-0105; AF Proj. 2308)
(AD-A105059; AFOSR-81-0615TR) Avail: NTIS HC A02/MF A01 CSCL 20/6

Under this contract a study was carried out of the optical properties of selected optical materials through data compilation, critical data evaluation and generation of recommended values based on available data from worldwide literature. The selected optical materials include alkali halides, alkaline earth halides, silicon and germanium, and III-V compounds. A major contribution of this work has been the exhaustive compilation of absorption coefficient and the formulation of an Urbach type equation for the multiphonon region near the infrared absorption edge of alkali halides and alkaline earth fluorides. This equation is used to calculate the intrinsic absorption coefficient as a function of both wavelength and temperature in the temperature region of practical interest with the calculated result in concordance with the best contemporary experimental measurements for the pure samples. Optical constants of silicon and germanium were studied in a similar manner as for the above mentioned materials. Refractive index data for silicon and germanium were exhaustively compiled and analyzed. Recommended values of refractive index for the transparent wavelength region were generated in the range 1.2 to 14 microns and 100-750 K for silicon, and 1.9 to 16 microns and 100-550 K for germanium. GRA

N82-13880# Massachusetts Inst. of Tech., Cambridge. Crystal Physics and Optical Electronics Lab.
INVESTIGATION OF PHOTOACOUSTOREFRACTIVE EFFECT IN LiNbO SUB 3 SAW DEVICES Final Report, 6 Feb. 1980 - 5 Feb. 1981
Arthur Linz and Hans P. Jenssen 14 Aug. 1981 5 p refs
(Contract DAAG29-80-C-0074)
(AD-A103705; ARO-17243.1-P) Avail: NTIS HC A02/MF A01 CSCL 20/6

Multiphoton photoelectric emission from lithium niobate is investigated. Thermionic emission occurs at energy density of about 1 J sq. cm at 1060nm and 530nm. GRA

N82-13881# Corning Glass Works, N.Y.
SINGLE MODE OPTICAL WAVEGUIDE DESIGN INVESTIGATION Progress Report
V. A. Bhagavatula, R. A. Westwig, and D. B. Kack 30 Mar. 1981 10 p ref
(AD-A098979; PR-2) Avail: NTIS HC A02/MF A01 CSCL 20/6

Measurements of lateral offset sensitivity were made on several fibers to determine reproducibility, and wavelength dependence. A modified expression for lateral offset loss was studied. Microband sensitivity measurements were made using the linear pin array and compared with the random microband test. Three fibes were determined to be within the fiber design matrix. The criteria for selecting a fiber was expanded to encompass equivalent step parameters whereby refractive index profile shapes other than the ideal step profile are taken into account. Author

N82-13882# Army Armament Research and Development Command, Aberdeen Proving Ground, Md.
DETERMINATION OF OPTICAL CONSTANTS FROM EXTINCTION MEASUREMENTS Technical Report, Apr. - Sep. 1980
M. E. Milham, R. H. Frickel, J. F. Embury, and D. H. Anderson Apr. 1981 33 p refs
(DA Proj. 1L1-62662-A-554)
(AD-A099494; AD-E410396; ARCSL-TR-81031) Avail: NTIS HC A03/MF A01 CSCL 20/6

The determination of the optical constants of aerosols from extinction data is reported. This is an iterative method which uses the Lorenz-Mie formalism in conjunction with the Kramers-Kronig dispersion relations to derive the optical constants of the aerosol material. The theory of the method is developed and is applied to find the optical constants of an o-phosphoric acid aerosol in the 7 to 14 micro infrared. Author

N82-13883# Utah State Univ., Logan. Electro-Dynamics Lab.
DETECTION OF TRACE GASES USING HIGH RESOLUTION

SPECTROSCOPY

A. S. Zachor (Atmospheric Radiation Consultants, Inc.), B. Bartchi, and M. Ahmakjian (Air Force Geophysics Lab., Hanscom AFB) 1981 8 p ref Reprinted from Proceedings of SPIE: The International Soc. for Optical Engr. Atmospheric Transmission, Apr. 1981, Washington, D.C.

(Contract F19628-77-C-0203; AF Proj. 7670)

(AD-A104841; AFGL-TR-81-0273) Avail: NTIS HC A02/MF A01 CSCL 07/4

The capability of a spectrometer system to remotely detect and characterize trace gases in localized cloud; e.g., a stationary source effluent is discussed. The detection method utilizes all of the information contained in the observed spectral radiance contrast between cloud and background. The degree to which this spectrum is correlated with a computed (FASCOD1) reference spectrum is determined. Trace gases are reliably detected even when spectrum features are well below the noise level. The minimum detectable quantities (MDQ's) for various trace games at one atmosphere total pressure are given. The HDQ's determine the combinations of gas column thickness and gas background temperature difference that correspond to 95 percent detection probability and one percent false detection probability for a given system noise equivalent spectral radiance. The capability of the method to remotely infer the gas column thickness and temperature are also discussed. GRA

N82-13884# Science Applications, Inc., San Diego, Calif.

OPTICAL SCANNER SYSTEM FOR INTERNAL INSPECTION OF STEAM-GENERATOR TUBES Final Report

G. D. Hall, E. A. Meckstroth, and V. J. Orphan Jul. 1981 127 p Sponsored by EPRI

(EPRI Proj. S103-2)

(EPRI-NP-1944) Avail: NTIS HC A07/MF A01

Both an improved low resolution scanner and a high resolution scanner and data acquisition system were designed. A low resolution scanner system was assembled, based on the design of the prototype scanner, with improvements in the mechanical and optical design, as well as the addition of a data acquisition and display system for accurate and realistic presentation of the image. Improving on the design of the low resolution system, a high resolution (720 element detector array) scanner was then designed and fabricated. The data acquisition and display system was also upgraded. The resultant system will image a circumferential band on the inside surface of a 0.670 in (17mm) tube to a precision of 480 picture elements. The performance evaluation of the two scanners included resolution tests and observation of simulated and actual defects in steam generator tubes. These test results are compared with similar evaluations of the prototype scanner. DOE

N82-13885# Sandia Labs., Albuquerque, N. Mex.

ELECTROOPTIC SHUTTER DEVICES UTILIZING PLZT CERAMIC WAFERS

Allen L. Thornton 1981 7 p refs Presented a the SPIE Intern. Symp., San Diego, Calif., 24 Aug. 1981

(Contract DE-AC04-76DP-00789)

(DE81-025470; SAND-81-0728C; CONF-810810-13) Avail: NTIS HC A02/MF A01

Optical transparency was achieved in lead zirconate-titanate ferrolectric ceramics by substituting moderate amounts of the element lanthanum (8 to 12 percent) for lead. These compositions exhibit the quadratic (Kerr) electrooptic effect. The excellent optical qualities of these materials (designated PLZT) has permitted the practical utilization of their electrooptic properties in a number of devices. Shutter devices developed and those in continuing development are described with respect to operational characteristics and physical configuration. Major efforts have centered on shutter development for the protection of aircrew from eye-damaging weapon effects. Other devices are also described which: provide eye protection for welders, protect vidicon tubes, function as page composers for holographic memories serve as large aperture photographic shutters, provide stereoscopic three dimensional TV displays, and serve as data links in a fiber optic transmission path. DOE

N82-13886# Los Alamos Scientific Lab., N. Mex.

OPTICS OF MASS SEPARATOR 1

Silvio J. Balestrini Jul. 1981 43 p refs

(Contract W-7405-eng-36)

(DE81-028242; LA-8893-MS) Avail: NTIS HC A03/MF A01

The ion optics of an existing mass separator are documented. The electroand magnetic stages are analyzed theoretically, both separately and in combination, by paying particular attention to the ion trajectories, the linear and angular magnifications, and the dispersion. The possibility of converting the magnet into a tunable unit by means of current-carrying elements in the gap is demonstrated. The feasibility of correction coils constructed from printed circuit board is shown. DOE

N82-13887# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

INFRARED VIBRATIONAL PREDISSOCIATION SPECTROSCOPY OF SMALL MOLECULAR CLUSTERS

James M. Lisy, Matthew F. Vernon, Andrzej Tramer, Hoi-Sing Kwok, Douglas J. Krajnovich, Y. R. Shen, and Y. T. Lee Jul. 1981 9 p refs Presented at the Intern. Conf. on Laser Spectroscopy, Alberta, Canada, 29 Jun. 1981

(Contract W-7405-eng-48)

(DE81-028648; LBL-12981; CONF-8106100-4) Avail: NTIS HC A02/MF A01

The structure and interaction of small molecular clusters were studied. Molecular beam electric resonance spectroscopy, Fourier-transform microwave spectroscopy and pressure induced infrared absorption spectra have provided information concerning the ground state structure and the intermolecular potential energy surface for a large number of binary systems. Vibrational predissociation experiments using molecular beam techniques and tunable infrared lasers measured the infrared absorption spectra and dynamical properties of many van der Waals and hydrogen bonded clusters. DOE

N82-13888# Sandia Labs., Albuquerque, N. Mex.

MINIMUM/CONSTANT VOLTAGE PLZT ELECTROOPTIC SHUTTERS

J. O. Harris, Jr., Jack D. Cyrus, and George R. Laguna 1981 7 p refs Presented at the SPIE Intern. Symp., San Diego, Calif., 24 Aug. 1981 Sponsored in part by the Air Force Life Support Systems Program Office, Wright-Patterson AFB, Ohio

(Contract DE-AC04-76DP-00789)

(DE81-028646; SAND-81-0727C; CONF-810810-19) Avail: NTIS HC A02/MF A01

Lead lanthanum zirconate titanate (PLZT) shutters were developed and proposed for several military and industrial applications. To achieve electronic simplification in the control circuitry, it is desirable to lower the voltage operating level to less than 600 volts, and to minimize logistic problems relating to spare lens inventories, it is desirable to produce shutters with a relatively constant operating voltage. Experimental data are presented for a number of electrode gap/PLZT wafer thickness ratios which indicate that this 600 volt maximum can be attained. A procedure is then described whereby manufactured shutters or lens assemblies can be electroded to operate over a narrow voltage range. DOE

N82-13889# California Univ., Livermore. Lawrence Livermore Lab.

TIME DEPENDENT RECORDING OF IMAGES TRANSMITTED OVER OPTICAL FIBERS

R. D. Lear 24 Aug. 1981 14 p refs Presented at the SPIE Intern. Symp., San Diego, Calif., 24 Aug. 1981

(Contract W-7405-eng-48)

(DE81-026599; UCRL-85609; CONF-810810-11) Avail: NTIS HC A02/MF A01

A system is being developed to record temporally and spatially resolved data after transmission through 1 km of optical fiber. Wavelength multiplexing techniques are used to transmit many spatial points over each 62/sub mu/m fiber. Light from the output end of each fiber is demultiplexed back into a spatial line. Four lines of data are focused sequentially across the input face of an RCA streak tube. System sensitivity is increased by coupling a microchannel plate image intensifier to the streak camera output. The image intensifier output is recorded on film. The streak camera gives 200 spatial points at a 25% CTF over a dynamic range of 20 db. The total usable streak length is 120 ns with a resolution of 600 ps. DOE

N82-13890# Los Alamos Scientific Lab., N. Mex.
FIBER OPTIC QUALITY ASSURANCE AT THE NEVADA TEST SITE
J. Manning, S. Baumgart, R. Malone, and D. Thayer 1981 5 p ref Presented at the 25th Tech. Symp. SPIE Tech. Programs Comm., San Diego, Calif., 24-28 Aug. 1981
(Contract W-7405-eng-36)
(DE81-028740; LA-UR-81-2137; CONF-810810-15) Avail: NTIS HC A02/MF A01

A large number of fiber optic cables were used in support of a neutron imaging experiment at the Nevada Test Site. The quality control testing of fiber components used on this experiment is described. The principal reason for quality control testing was to ensure reliable, high transmission fibers, a secondary reason was to gain data on a large sample of fiber cables in the field. The instrumentation developed for carrying out these field measurements is discussed. DOE

N82-13891# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Electronique et Physique.
FAR INFRARED SOURCE CLASSIFICATION SYSTEM Ph.D. Thesis [SYSTEME DE CLASSIFICATION DES SOURCES INFRAROUGE LOINTAIN]
Mohamed Youssry Mahmoud Apr. 1980 333 p refs
(ENST-E-80005) Avail: NTIS HC A15/MF A01

A hardware solution to the problem of classification of isolated IR sources is proposed. The impact of IR technology on the design of a special purpose nonimage forming IR system is discussed. Simulation of the system elements and their effect on IR image acquisition, feature extraction, and classification is analyzed. The algorithms of feature extraction by on-line routines or special purpose hardware are explained. A high density IR mosaic detector is presented which allows for efficient extraction. Although the proposed mosaic geometry is intended for nonimaging applications, its possible extension to IR imaging is pointed out. Author (ESA)

N82-13892# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Electronique et Physique.
EXPERIMENTAL STUDY OF HETERODYNE PHOTODETECTION. PERSPECTIVES FOR APPLICATIONS TO OPTICAL TRANSMISSION Ph.D. Thesis [ETUDE EXPERIMENTALE DE LA PHOTODETECTION HETERODYNE. PERSPECTIVES D'APPLICATIONS AUX TRANSMISSIONS OPTIQUES]
Mondher Attia Dec. 1980 247 p refs In FRENCH; ENGLISH summary
(ENST-E-80013) Avail: NTIS HC A11/MF A01

Heterodyne photodetection in the visible and near infrared spectral ranges was studied. The physical principles underlying the operation of the different components used to establish optical links are recalled. Performance and limitations of incoherent photodetection are then reviewed. A classical electromagnetic representation of heterodyne detection is presented, illustrating advantages and difficulties of application. After a justification of component choices, the experimental setup is described, and results are discussed. The outlook for utilization of heterodyne photodetection in a monomode fiber transmission system is indicated. Author (ESA)

N82-13893 Stanford Univ., Calif.
FIBER OPTIC TIME DOMAIN REFLECTOMETERS: APPROACHES TO PERFORMANCE IMPROVEMENT Ph.D. Thesis
Young Dae Kim 1981 222 p
Avail: Univ. Microfilms Order No. 8124095

The faults and loss profile of an optical fiber cable are conveniently measured by an optical time domain reflectometer (OTDR). The measured results are, however, severely contaminated by various types of noise due to incoherent optical detection, frequently requiring further signal processing. The conventional approach is straightforward signal averaging, which does not take advantage of the unique signal statistics related to low level optical detection. The measurement system was studied from a systems point of view emphasizing performance optimization through signal processing and signal selection. Low level detection requires nonlinear processing, such as threshold detection (photon-counting) or the noise power method. Dissert. Abstr.

N82-13894 Stanford Univ., Calif.
A VACUUM ULTRAVIOLET RADIATION SOURCE USING CERENKOV RADIATION Ph.D. Thesis
John Charles Sheppard 1981 173 p
Avail: Univ. Microfilms Order No. 8124151

An apparatus was designed, fabricated, and installed in a drift section near the end of the Stanford Linear Accelerator Center (SLAC) three kilometer accelerator. When the apparatus is filled with helium, the SLAC primary beam characterized by its high energy, high current, and small emittance, generates a Cerenkov spectrum which is continuous from the infrared through the visible to 584A. Like a synchrotron source, the Cerenkov source generates a well collimated, spectrally that continum extending through the VUV which is free from absorption and emission lines. The flux of synchrotron radiation from SPEAR in the VUV is approximately one hundred billion photons/s per 10% bandwidth per mrad of arc in the orbital plane per mA of beam current, assuming 10% collection efficiency. The observed Cerenkov source flux is about one hundred billion photons/s per 10% bandwidth per mrad divergence per mA of beam current, @ 1000A including mirror and bandwidth limiting iris losses and impurity absorption. Dissert. Abstr.

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N82-13895 Georgia Univ., Athens.
FUNDAMENTAL STUDIES OF DIRECT CURRENT PLASMAS Ph.D. Thesis
Ronald Ralph Williams 1981 173 p
Avail: Univ. Microfilms Order No. 8123110

Emission profiles of the group IIA elements in both the two and three-electrode direct current plasmas (DCP) are presented. In both cases the optimum emission zone of calcium occurs lower in the plasma than any other element studied. Since calcium most closely approaches argon in atomic mass, a collision mechanism involving some form of argon is implicated in the excitation mechanism. However no present theory accurately accounts for the observed emission profiles of the group IIA elements. Enhancements of analyte emisson caused by the presence of easily ionized elements were studied using emission profiles for calcium and a water-cooled electrical probe. The observed changes in the calcium profile can be qualitatively explained by the change in thermal conductivity of the region below the plasma body induced by the ionization of the concomitant. Dissert. Abstr.

N82-13896 California Univ., Los Angeles.
ION CYCLOTRON RESONANCE HEATING AND ITS EFFECT ON CONFINEMENT IN TOKAMAKS Ph.D. Thesis
Ki Woong Whang 1981 151 p
Avail: Univ. Microfilms Order No. 8122885

Ion cyclotron resonance heating (CRH) and its effect on plasma confinement in Tokamaks is considered. The analysis is based on the single particle equations of motion in the 'quasi-adiabatic approximation', i.e., taking advantage that in the absence of collisions, the ion guiding center variables are conserved over most of a particle's trajectory. Nonadiabatic changes in these variables occur only when an ion passes through the localized cyclotron resonance. The effect of RF on electron motion is neglected. The collison less heating is treated both analytically and numerically using a set of finite mapping equations. The stochastic nature of ICRH in the absence of collisions is investigated and the threshold RF electric field amplitude for the transition from the superadiabatic to the stochstic regime is found. The characteristic regimes of two presently operating tokamaks, Macrotor and PTL, are used as a guide in choosing parameter values. The effect of heating on confinement is examined by studying the changes in single particle orbits produced by the RF and the resultant time is compared with the neoclassical confinement time and the charge exchange time. Dissert. Abstr.

N82-13897 Stanford Univ., Calif.
PULSE PROPAGATION IN DISPERSIVE MEDIA WITH APPLICATIONS TO PLASMAS Ph.D. Thesis
Robert Joseph Vidmar 1981 372 p
Avail: Univ. Microfilms Order No. 8124167

The wave properties deduced from wave-packets demonstrate that periodic and transient sources excite amplifying and decaying waves, which have identical frequencies but different signal velocities, phase velocities, and growth rates. The analysis for the amplifying waves in a beam-plasma system exemplifies these source-dependent properties. These results also apply to decaying-wave phenomena such as ray tracing in a absorptive medium and radar pulses in a lossy media. Wave-packets propagating parallel and perpendicular to the Earth's magnetic field in the F-layer of the ionosphere are examples of dispersive wage propagation excited by transient sources. These waveforms suggest a diagnostic method to deduce plasma parameters and the orientation and distance to the transient source from its wave-packet. Dissert. Abstr.

N82-13898 Stanford Univ., Calif.
THE REVERSE-FIELD RIGID ROTOR MODEL, CALCULATION AND SIMULATION Ph.D. Thesis
Michael Leo Blake 1981 129 p
Avail: Univ. Microfilms Order No. 8124037

An example of an equilibrium reverse-field plasma configuration the rigid rotor model is based on counter-rotating Maxwellian velocity distributions of electrons and ions. The drift velocity on the Maxwellian distributions corresponds to rigid rotation and represents the most probable distribution of charged particles in axi-symmetric magnetic fields. Due to the circulating (theta) currents, the confining axial (z) magnetic field changes direction within the plasma. The known analytic solution for the one dimensional (r dependent) case is discussed in terms of the magnetohydrodynamic force equation and numerical solutions of the two dimensional (r and z dependent) case are presented. Numerical solutions showing a density peak beneath the confining coils are presented along with the expected solutions with the density peak between the coils. A two-and-one-half dimensonal particle simulation is used to examine the stability of these reverse-field equilibria in the plane perpendicular to the applied magnetic field. Dissert. Abstr.

N82-13899# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ENERGY AND MOMENTUM DEPOSITION TO PLASMAS DUE TO THE LOWER HYBRID WAVE BY A FINITE SOURCE
Noriyoshi Nakajima, Hirotada Abe, and Ryohei Itatani Oct. 1981 68 p refs
(IPPJ-546) Avail: NTIS HC A04/MF A01

Heating and current generation due to the lower hybrid wave are studied using particle simulation. A propagation cone consisting of Fourier expanded modes is emphasized. The trajectory of the propagation cone is well described up to the lower hybrid resonance layer using both cold plasma approximation and the Wentzel-Kramer-Brillouin method. An ion cross field drift due to the ponderomotive force is observed. The modes in the higher side of the spectrum of the antenna play a key role for creation of the ion high energy tail. This process is called the cascade process judging from the time variation of the damping of each mode. The particle model is significantly improved using the elongated grid and the quadric spatial interpolation. R.J.F.

N82-13900# Nagoya Univ. (Japan).
OXYGEN TRANSPORT AND LINE EMISSIONS IN A TOKAMAK PLASMA
Takako Kato, Masashi Kako, Tsuneo Amano, Yasuyuki Nomura, and Satio Hayakawa Sep. 1981 34 p refs
(IPPJ-544) Avail: NTIS HC A03/MF A01

Two models which describe the behavior of impurity in Tokamaks are investigated: one is the drift model and the other the diffusion model. The drift model is a simplified one in which impurity ions drift only inward, while the diffusion of impurities is taken into account in the diffusion model. The results of the two models are compared. Spectroscopic data on oxygen impurities in JIPP T-2 Tokamaks are employed for comparison with the theoretical results in which metastable populations were considered to calculate the line intensities. Oxygen transport is well interpreted with the neutral influx of energy 10 to 50 eV and anomalous diffusion of magnetic 5000 (n sub max/n sub e(r)) sq cm/sec. Author

N82-13901# Nagoya Univ. (Japan). Inst. of Plasma Physics.
TOROIDAL PLASMA CURRENT SUSTAINMENT BY LOWER HYBRID WAVES IN THE WT-2 TOKAMAK
M. Nakamura, T. Cho, S. Kubo, T. Shimozuma, H. Kawai, Y. Yamazaki, T. Maekawa, Y. Terumichi, S. Tanaka, and Y. Hamada Oct. 1981 16 p refs Prepared in cooperation with Kyoto Univ., Japan
(IPPJ-545) Avail: NTIS HC A02/MF A01

Injecting RF power P sub RF near the lower hybrid frequency into an Ohmic heating plasma near the end of Tokamak discharge in the WT-2, and RF driven current sustained plasma is produced and continued to exist during the RF injection period, where the toroidal current (T sub p approximately 10 kA) is generated by the lower hybrid wave only without the Ohmic power. The efficiency of RF driven current generation is high and attains to I sub/P sub RF approximately 0.9 kA/kW. Author

N82-13902# Nagoya Univ. (Japan). Inst. of Plasma Physics.
SOFT AND HARD MAJOR DISRUPTIONS IN THE PROFILE CONTROL EXPERIMENT OF THE JIPP T-2 TOKAMAK
K. Toi, K. Sakurai, S. Tanahashi, and S. Yasue Sep. 1981 43 p refs
(IPPJ-547) Avail: NTIS HC A03/MF A01

The nonlinear saturation theory of tearing modes is applied to the Tokamak plasmas produced by an appropriate combination of gas puffing and plasma current-rise in JIPP T-2. The calculated relative amplitude of poloidal field fluctuations has good correlation with the experimental data. The radial extent of the island widths of m/n = 2/1 and 3/2 modes which are derived in the calculation suggests that the 'soft' major disruption, where a plasma current suffers only slight change, can be triggered by either the overlapping of 2/1 island with 3/2 one or the contact of 2/1 island with a limiter. Moreover, it is consistent with the experimental data the hard major disruption, which brings about the abrupt and significant reduction of the plasma curent, results from the combined process of two above-mentioned causes of the soft major disruption. Author

N82-13903# Nagoya Univ., Toyokawa (Japan). Inst. of Plasma Physics.
ELECTROMAGNETIC CYCLOTRON HARMONIC WAVES
T. Ohnuma, T. Watanabe, and K. Hamamatsu Sep. 1981 15 p refs
(IPPJ-536) Avail: NTIS HC A02/MF A01

Electromagnetic electron cyclotron harmonic waves just below the electron cyclotron harmonics were investigated numerically and experimentally. Backward waves which were observed to propagate nearly perpendicular to the magnetic field just below the electron cyclotron frequency in a high density magnetoplasma were confirmed to be in accord with the theoretical electromagnetic cyclotron waves. R.J.F.

N82-13904# Nagoya Univ., Toyokawa (Japan). Inst. of Plasma Physics.
PLASMA FOCUS BREEDER
Kazunari Ikuta Sep. 1981 15 p refs
(IPPJ-541) Avail: NTIS HC A02/MF A01

High voltage generation on pinched plasma by a plasma focus device was investigated. Fissile fuels are bred with the help of high current plasma focus device. A mechanism of accelerating proton beam in plasma focus device to high energy changes the inductance in plasma column because of rapid growth of plasma instability. It is concluded that a high current plasma focus device is a good candidate for the generation of energetic, intense proton beams which can be utilized for breeding fissile fuels. E.A.K.

N82-13905# Nagoya Univ., Toyokawa (Japan). Inst. of Plasma Physics.
FEEDBACK PLASMA CONTROL IN HYBRID POLOIDAL COIL SYSTEM
Y. Hamada, Y. Abe, S. Kitagawa, and K. Toi Sep. 1981 25 p refs
(IPPJ-542) Avail: NTIS HC A02/MF A01

Analysis of feedback control characteristics in the hybrid poloidal coil system (hybrid of the ohmic and the equilibrium vertical coils) is performed. It is found that, in the complex hybrid poloidal coil system, the plasma can be sufficiently well controlled using very simple equations for the calculation of feedback voltage. Author

N82-13906# Nagoya Univ., Toyokawa (Japan). Inst. of Plasma Physics.
NUMERICAL STUDY ON THE INTERACTION BETWEEN A MODULATED ELECTRON BEAM AND A PLASMA
Osamu Fukumasa and Ryohei Itatani Sep. 1981 48 p refs (IPPJ-543) Avail: NTIS HC A03/MF A01

Interaction of a modulated electron beam with a plasma is calculated for unbounded and bounded electron beam-plasma systems, using the method of partial simulation. In the case of the unbounded system, deformation of the beam distribution function is occurred in relation to suppression of one wave by the other wave. While, in the case of the bounded system, occurrence of deformation depends on whether feedback effects of reflected beams are present or not. The findings are qualitatively in agreement with experimental results. Author

N82-13907# Nagoya Univ. (Japan). Inst. of Plasma Physics.
DATA ON THE BACKSCATTERING COEFFICIENTS OF LIGHT IONS FROM SOLIDS
Tatsuo Tabata (Osaka Prefecture), Rinsuke Ito (Osaka Prefecture), Yukikazu Itikawa, Noriaki Itoh, and Kenji Morita Oct. 1981 118 p refs Submitted for publication
(IPPJ-AM-18) Avail: NTIS HC A06/MF A01

Data on the backscattering of H, D and He ions from solids were collected. The following parameters are considered: number backscattering coefficient energy backscattering coefficient, and the mean fractional energy of backscattered particles. Most of the data range in the region of incident energy from 1 to 50 keV. The empirical formulas, obtained from the Monte Carlo results for energies below 1 keV are plotted for energies from 10 eV to 100 keV. The rms deviations of the data from the empirical formulas are between 6 and 30 percent. E.A.K.

N82-13908*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF VACUUM EXHAUST PRESSURE ON THE PERFORMANCE OF MHD DUCTS AT HIGH D-FIELD
J. Marlin Smith, J. L. Morgan, and Shih-Ying Wang 1982 13 p refs Presented at the 20th Aerospace Sci. Meeting, Orlando, Fla., 11-14 Jan. 1982; sponsored by AIAA
(Contract DE-AI01-77ET-10769)
(NASA-TM-82750; DOE/NASA/10769-23; F-1066) Avail: NTIS HC A02/MF A01 CSCL 20I

The effect of area ratio variation on the performance of a supersonic Hall MHD duct is investigated. Results indicate that for a given combustion pressure there exists an area ratio below which the power generating region of the duct is shock free and the power output increases linearly with the square of the magnetic field. For area ratios greater than this, a shock forms in the power generating region which moves upstream with increasing magnetic field strength resulting in a less rapid raise in the power output. The shock can be moved downstream by either increasing the combustion pressure of decreasing the exhaust pressure. The influence of these effects upon duct performance is presented. B.W.

N82-13909# Oak Ridge National Lab., Tenn.
EBT STABILITY THEORY: PROCEEDINGS OF THE WORKSHOP
1981 307 p refs Workshop held in Oak Ridge, Tenn., 13-14 May 1981
(Contract W-7405-eng-26)
(DE81-030635; CONF-810512) Avail: NTIS HC A14/MF A01

The limits of density, beta, and anisotropy are discussed. Topics include: mirror machines, theta pinch, zeta pinch, hot and cold plasmas, hot electrons, toroidal plasmas, and reactor design. Both macro and micro magnetohydrodynamic stability are considered. Emphasis is placed on ring stability and plasma control. For individual titles, see N82-13910 through N82-13922.

N82-13910# Applied Microwave Plasma Concepts, Encinitas, Calif.
RUDIMENTARY THEORIES OF THE STABILITY OF MICROWAVE-HEATED PLASMAS
G. E. Guest *In* ORNL EBT Stability Theory 1981 p 15-32 refs (For primary document see N82-13909 04-75)
Avail: NTIS HC A14/MF A01

The main results from theoretical studies of two obvious sources of plasma instability, anisotropic distributions of particle velocities and locally unfavorable curvature in the magnetic lines of force, are reviewed. Three distinct components of the underlying theoretical models were identified and the degree of realism or completeness achieved in each was assessed: the basic equilibrium model; the set of field equations and polarizations assumed; and the plasma constitutive relations used. T.M.

N82-13911# Oak Ridge National Lab., Tenn.
REVIEW OF RECENT EBT COUPLED RING-CORE STABILITY THEORY
D. A. Spong *In its* EBT Stability Theory 1981 p 33-62 refs (For primary document see N82-13909 04-75)
(Contract W-7405-eng-26)
Avail: NTIS HC A14/MF A01

During the past several years Elmo Bumpy Torus (EBT) stability calculations evolved with respect to treatment of ring-core plasma coupling effects. This evolution began with recognition of the important role of ring compressibility and paramagnetic effects on core beta limits. Models continued to increase in sophistication, including ring-core frequency coupling, velocity space and hot electron distribution function effects, and radically dependent models. Some of these features resulted in wide variations in predicted plasma performance limitations. A number of the models were reviewed and assumptions to which they are particularly sensitive are discussed. T.M.

N82-13912# Oak Ridge National Lab., Tenn.
BRIEF SURVEY OF EXPERIMENTAL INVESTIGATION OF INSTABILITIES IN MICROWAVE-HEATED PLASMAS
N. A. Uckan and G. R. Haste *In its* EBT Stability Theory 1981 p 63-72 refs (For primary document see N82-13909 04-75)
Avail: NTIS HC A14/MF A01

Nearly two decades of experimental investigations exist on instabilities in hot electron plasmas in open (simple and minimum-B mirrors) and closed (bumpy tori, EBT and NBT) geometries. A brief review is given for some of the results from these experiments. Also discussed is the observed behavior of the plasma in C-T and T-M transitions in EBT. T.M.

N82-13913# Oak Ridge National Lab., Tenn.
FLUCTUATION MEASUREMENTS IN EBT
L. Bighel, G. R. Haste, and A. Komori *In its* EBT Stability Theory 1981 p 75-82 (For primary document see N82-13909 04-75)
Avail: NTIS HC A14/MF A01

The stabilty aspects associated with fluctuations in EBT-I were investigated with probes and with light detectors. The EBT-S environment is not suitable to the use of probes, except near the wall. Laser-microwave scattering techniques were investigated for spatially resolved fluctuation measurements in EBT-S. An effort aimed at correlating the fluctuation behavior with the ambipolar potential and the hot ion component in the plasma is reported. T.M.

N82-13914# Tennessee Univ., Knoxville.
HOT-ELECTRON RING STABILITY AT THE UNIVERSITY OF TENNESSEE
Igor Alexeff and Marshall Saylors (Kentucky Univ.) *In* ORNL EBT Stability Theory 1981 p 83-94 (For primary document see N82-13909 04-75)
(Grant NSF ENG-78-03400)
Avail: NTIS HC A14/MF A01

A model that is sufficient to explain the observed stability is presented. The plasma forms a hollow ring in close proximity to the copper all. Moving the ring away from the copper wall causes instability, plasma loss, or simple prevents the ring from forming. The ring was moved from the wall by magnetic compression or by a metal or ceramic limiter. T.M.

N82-13915# Texas Univ., Austin. Inst. for Fusion Studies.
EIGENMODE STABILITY ANALYSIS FOR A BUMPY TORUS
J. W. VanDam, H. L. Berk, M. N. Rowenbluth (ORNL), and D. A. Spong *In* ORNL EBT Stability Theory 1981 p 97-114 refs (For primary document see N82-13909 04-75)
Avail: NTIS HC A14/MF A01

The analysis of eigenmodes in a bumpy torus yielded several stability boundaries that indicate the existence of a parameter regime for generally stable operation consistent with current experiments. A relatively narrow band of parameters where instability persists was obtained and these parameters are discussed. T.M.

N82-13916# Oak Ridge National Lab., Tenn.
NUMERICAL SOLUTIONS OF THE EBT RADIAL EIGENMODE PROBLEM
D. A. Spong, J. W. VanDam, H. L. Berk, and M. M. Rosenbluth *In its* EBT Stability Theory 1981 p 115-140 refs Prepared in cooperation with Texas Univ., Austin (For primary document see N82-13909 04-75)
Avail: NTIS HC A14/MF A01

The radial structure of eigenmodes in EBT is of interest since both modes which are localized within the annulus and moles which extend into the core plasma were predicted to be unstable within appropriate parameter regimes. Radially resolved calculations were done for a z-pinch model which corresponds to a bumpiless, azimuthally symmetric version of EBT. A shooting method was employed which solves two-point boundary value problems on the inside and outside of the ring and which matches derivatives at the center. Comparison of these results with those of a localized dispersion relation are discussed. T.M.

N82-13917# Oak Ridge National Lab., Tenn. Fusion Energy Div.
STABILITY OF HOT ELECTRON PLASMA IN THE ELMO BUMPY TORUS
K. T. Tsang and C. Z. Cheng (Princeton Univ.) *In its* EBT Stability Theory 1981 p 141-160 refs (For primary document see N82-13909 04-75)
Avail: NTIS HC A14/MF A01

The stability of a hot electron plasma in the ELMO Bumpy Torus was investigated using two different models. In the first model, where the hot electron distribution function is assumed to be a delta function in the perpendicular velocity, a stability boundary in addition to those discussed by Nelson and by Van Dam and Lee is found. In the second model, where the hot electron distribution function is assumed to be a Maxwellian in the perpendicular velocity, stability boundaries significantly different from those of the first model are found. Coupling of the Nelson-Van Dam-Lee mode to the compressional Alfven mode is now possible. This leads to a higher permissible core plasma beta value for stable operation. T.M.

N82-13918# Princeton Univ., N. J. Plasma Physics Lab.
ANALYTICAL THEORY OF INTERCHANGE AND COMPRESSIONAL ALFVEN INSTABILITIES IN EBT
C. Z. Cheng and K. T. Tsang (ORNL) *In* ORNL EBT Stability Theory 1981 p 161-178 refs (For primary document see N82-13909 04-75)
Avail: NTIS HC A14/MF A01

The local stability of the EBT plasma is analyzed for the long wavelength perturbations in the frequency regime, omega approximately less than the ion cyclotron frequency sub i. In addition to the low frequency interchange instability, the plasma can be unstable to the compressional Alfven wave. Contrary to the previously obtained quadratic dispersion relation in omega for the interchange mode, the relations for both types of instabilities are cubic in omega. New stability boundaries are found, for the ho electron interchange mode, to relate to the enhanced compressibility of the core plasma in the preence of hot electrons. The compressional Alfven instability is driven due to the coupling of hot electron magnetic drifts and diamagnetic drift with the compressional Alfven wave. The stability conditions of these two types of instabilities are opposite to each other. T.M.

N82-13919# JAYCOR, San Diego, Calif.
MICROSTABILITY OF THE EBT BOUNDARY
N. T. Gladd, N. A. Krall, S. Hamasaki, and J. L. Sperling *In* ORNL EBT Stability Theory 1981 181-210 refs (For primary document see N82-13909 04-75)
Avail: NTIS HC A14/MF A01

An analysis of the microstability properties using local theory to focus on the effects the relativistic electrons have on low and high frequency drift waves, is presented. The ring electrons are found to have a stabilizing effect, primarily through their contribution to strong magnetic field gradients. A more detailed nonlocal theory was used to analyze the effects of the diamagnetic well on the lower-hybrid-drift instability, a particularly virulent high frequency drift instability. It is found that the presence of the diamagnetic well reduces this instability's rate of growth but that unstable eigenmodes persist for reasonable values of beta sub ring and span a significant portion of the boundary layer. The relative importance of the residual anomalous resistivity when compared to classical resistivity and classical viscosity is discussed. T.M.

N82-13920# California Univ., Livermore. Lawrence Livermore Lab.
ELECTRON-CYCLOTRON RESONANT HEATED ELECTRON DISTRIBUTION FUNCTIONS
Y. Matsuda, W. M. Nevins, and R. H. Cohen *In* ORNL EBT Stability Theory 1981 p 211-226 refs (For primary document see N82-13909 04-75)
(Contract W-7405-eng-48)
Avail: NTIS HC A14/MF A01

Studies with a bounce-averaged Fokker-Planck code indicate that the energetic electron tail formed by electron-cyclotron resonant heating (ECRH) at the second harmonic is not Maxwellian. The results of a bounce-averaged Fokker-Planck code are presented along with some simple analytic models of hot-electron distribution functions. T.M.

N82-13921# General Atomic Co., San Diego, Calif.
KINETIC STABILITY ANALYSES IN A BUMPY CYLINDER
R. R. Dominguez and H. L. Berk (Texas Univ. at Austin) *In* ORNL EBT Stability Theory 1981 p 249-264 refs (For primary document see N82-13909 04-75)
(Contract DE-AT03-76ET-51011)
Avail: NTIS HC A14/MF A01

A fully kinetic formalism for performing nonlocal stability analyses in a bumpy cylinder was developed. The Vlasov-Maxwell integral equations (with one ignorable coordinate) are shown to be self adjoint and hence amenable to analysis using numerical techniques developed for self adjoint systems of equations. The representation obtained for the kernel of the Vlasov-Maxwell equations is a differential operator of arbitrarily high order. This form leads to a manifestly self adjoint system of differential equations for long wavelength modes. T.M.

N82-13922# Oak Ridge National Lab., Tenn.
EFFECT OF BETA LIMITS ON REACTOR PERFORMANCE IN EBT
N. A. Uckan, D. A. Spong, and D. B. Nelson (DOE, Washington, D.C.) *In its* EBT Stability Theory 1981 p 281-295 refs (For primary document see N82-13909 04-75)
Avail: NTIS HC A14/MF A01

Sensitivity studies that can be carried out to determine the boundaries of the operating regime and to demonstrate the effects of various modes, assumptions, and models on reactor performance (Q value) are described. First the modes believed to limit the core beta and ring plasma performance are discussed, and the simplifications and/or assumptions involved in deriving these limits are highlighted. Then, the implicatios of these limits for a reactor are given. T.M.

N82-13923# Wisconsin Univ., Madison.
DRIVING FORCE OF THE BALLOONING INSTABILITY
M. W. Phillips and S. C. Prager Jul. 1981 9 p refs
(Contract DE-AS02-76ET-53051)
(DE81-023099: DOE/ET-53051/25) Avail: NTIS HC A02/MF A01

It is shown that the ballooning mode is (diamagnetic) current

driven, not pressure driven. A physical picture and application to experiment is provided. DOE

N82-13924# Princeton Univ., N. J. Plasma Physics Lab.
ENHANCED-CONFINEMENT CLASS OF STELLARATORS
H. E. Mynick, T. K. Chu, and A. H. Boozer Aug. 1981 14 p refs
(Contract DE-AC02-76CH-03073)
(DE81-028727; PPPL-1822) Avail: NTIS HC A02/MF A01

A class of stellarators was found in which the transport is reduced by an order of magnitude from transport in conventional stellarators, by localizing the helical ripple to the inside of the torus. The reduction is observed in numerical experiments and explained theoretically. DOE

N82-13925# Los Alamos Scientific Lab., N. Mex.
FIBER OPTIC ANALOG AND TIMING MONITORING SYSTEM FOR THE ANTARES LASER FUSION PROGRAM
J. L. Longmire and M. E. Thuot 1981 5 p Presented at the SPIE Intern. Symp., San Diego, Calif., 24 Aug. 1981
(Contract W-7405-eng-36)
(DE81-028799; LA-UR-81-2193; CONF-810810-12) Avail: NTIS HC A02/MF A01

The development and use of two optical fiber systems for the Antares 40 KJ CO2 laser is described. In the Antares power amplifier, electron guns produce a discharge-sustaining B KA beam of 500 kV electrons. Eight 300 kJ, 3 microns Marx pulsers provide a direct electrical pumping discharge through the laser gas. The electro-optic systems developed allow the measurement of pulsed analog waveforms and trigger timing information within the laser and power systems by a computer based control and data acquisition network. DOE

N82-13926# Mississippi State Univ., Mississippi State. MHD Energy Center.
TESTING AND EVALUATION OF MHD MATERIALS AND SUBSTRUCTURES Final Technical Report, Apr. 1976 - Jun. 1981
Jun. 1981 204 p refs
(Contract DE-AC01-76ET-10785)
(DE81-024331; DOE/ET-10785/T1) Avail: NTIS HC A10/MF A01

Stand that can simulate the environment in any of the various substructures of a coal fired baseline MHD power plant. After construction was completed, shakedown tests were performed, and the Test Stand was used in a series of tests to simulate the gas stream composition and temperature conditions in the baseline plant's radiant boiler. The tests were conducted in order to study the effect of stoichiometry and staged combustion on the generation of nitrogen oxide. A computer based monitoring and control system was developed that provides safe Test Stand operation, controls the critical parameters, and accurately measures, displays, and logs the necessary physical data. Several computer programs were developed to determine the thermal performance of the Test Stand, and several models were developed to predict the thermal performance of the Test Stand with bare walls and with slag coated walls, and to determine the gas stream properties as a function of temperature and pressure. DOE

N82-13927# Fom-Instituut voor Plasmafysica, Rijnhuizen (Netherlands).
ON HIGH BETA EQUILIBRIA OF PLASMAS IN THE QUASI-UNIFORM CURRENT MODEL: INFLUENCE OF SHAPING THE PLASMA CROSS SECTION AND OF THE SECOND ORDER IN THE INVERSE ASPECT RATIO
W. Schuurman and C. Bobeldijk Apr. 1981 32 p refs Sponsored by Euratom and Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek (ZWO)
(Rept-81-131) Avail: NTIS HC A03/MF A01

Analytical calculations of toroidal plasma equilibria in the high beta ordering were performed in the quasi-uniform current model, varying the shape of the poloidal plasma crosssection. The effect of the second order in an expansion in the inverse aspect ratio was determined for a plasma with elliptic crosssection. Analytical representation of curves with a shape deviating from an ellipse (e.g., racetrack, triangle, rectangle) enabled the treatment of high beta equilibria of plasmas having these curves as poloidal crosssection. A smooth current profile or a flat plasma crosssection allow higher values of beta p than a skin current or a vertically pointed crosssection. Also, D-shaping improves the equilibrium beta p especially at higher values of the ellipticity. The method of crosssection shaping allows, in principle, the extension to higher mode harmonic contributions. Author (ESA)

N82-13928# National Bureau of Standards, Boulder, Colo. Fracture and Deformation Div.
MATERIALS STUDIES FOR MAGNETIC FUSION ENERGY APPLICATIONS AT LOW TEMPERATURES -4
R. P. Reed, ed. and N. J. Simon, ed. Apr. 1981 659 p refs Sponsored in part by DOE
(PB81-222507; NBSIR-81-1645) Avail: NTIS HC A99/MF A01 CSCL 18A

The low temperature mechanical and physical properties of stainless steel base metal and welds, particularly the nitrogen strengthened stainless steels are evaluated. Aluminum alloys have received some consideration. Nonmetallics, primarily industrial laminates are investigated for low temperature applications and their properties measured at cryogenic temperatures. GRA

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N82-13929 Stanford Univ., Calif.
CURRENT TRANSIENT SPECTROSCOPY OF DEEP LEVELS IN SILICON Ph.D. Thesis
Judith Aviva Borsuk 1981 120 p
Avail: Univ. Microfilms Order No. 8124039

A high sensitivity deep level transient spectrometer was built, which detects diode current transients induced by pulsing the reverse bias, and correlates them with an internally generated exponential waveform. The technique is designated current transient spectroscopy (CTS). Theoretical calculations of system performance under various circumstances are presented, along with example spectra of defects in silicon p(+)n diodes. A spectrum of unintentional defects is shown to closely match computer calculations of the expected peak shape. A theoretical analysis of noise and signal to noise ratio was performed, yielding results consistent with the measured output noise and sensitivity. Spectra of diodes heat treated in quartz and SiC furnace tubes are presented which demonstrate the utility of CTS in detecting processing induced contamination in concentrations as low as 10 to the 9th power. Dissert. Abstr.

N82-13930 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
CHARGE TRAPPING IN INTERFACE DOPED MNOS STRUCTURES Ph.D. Thesis
William Gardner Sutton 1981 195 p
Avail: Univ. Microfilms Order No. 8123464

Parameters of evaporated tungsten interface dopant induced traps, naturally occurring oxide-nitride interface traps and nitride bulk traps in conventional and interface doped MNOS structures were examined using charge centroid and thermally stimulated current techniques. Charge centroid measurements showed charge trapping in interface doped MNOS structures occurred at the oxide-nitride interface for injected charge levels below a trap saturation level. The saturation level depended more on the oxide thickness than on the dopant density decreasing as oxide thickness increased. Above the saturation level considerable charge trapping in the nitride occurred, causing the charge centroid to approach the mid point of the nitride. conventional MNOS structures exhibited charge centroid values equal to the nitride mid point. Dissert. Abstr.

N82-13931 Wisconsin Univ. - Madison.
COEXISTENCE OF NON-REGISTERED MONOLAYER AND BILAYER SOLID FILMS Ph.D. Thesis
Mein Sieng Wei 1981 84 p
Avail: Univ. Microfilms Order No. 8117547

Statistical thermodynamic theories are formulated for

monolayer and bilayer solid films of inert gases in physical adsorption. At low temperatures, the quasiharmonic approximation is used to evaluate the Helmholtz free energies of the adsorbed phases. At higher temperatures, the free energies are evaluated using the single occupancy cell theory including part of the correlation energy. With realistic models for adatom interactions and substrate holding potentials, the theories are applied to three physical systems: Xe/Ag(111), Ar/Gr and Kr/Ag(111). Phase diagrams and thermodynamic functions along the phase boundaries are calculated. The calculated difference between the latent heats of adsorption of the monolayer and the bilayer is in good agreement with experimental data for Xe/Ag(111) and Ar/Gr, but it is significantly smaller than the experimental difference for Kr/Ag(111). Dissert. Abstr.

N82-13932 Stanford Univ., Calif.
SUPERCONDUCTIVITY OF THE A15 COMPOUND NIOBIUM ALUMINUM Ph.D. Thesis
Jueinai Raynien Kwo 1981 214 p
Avail: Univ. Microfilms Order No. 8124099

The microscopic superconducting properties of the metastable high transition temperature A15 compound niobium aluminum were investigated in this work to further understand the origins of the high transition temperature in the A15 superconductors as a whole class. Material synthesis on A15 thin films was carried out using electron-beam coevaporation to determine the A15 phase equilibrium and to establish the conditions of preparing homogeneous materials. Superconducting tunneling into high-quality. Nb-Al junctions was used to diagnose the material properties of the A15 Niobium Aluminum and shows that it is strongly electron-phonon coupled only when the composition approaches the A15 phase boundary. Tunneling spectroscopy analysis gives striking evidence of mode-sofening mechanism responsible for the stronger coupling and the higher transition temperature. Dissert. Abstr.

N82-13933 Purdue Univ., Lafayette, Ind.
THE STRUCTURAL AND VIBRATIONAL PROPERTIES OF AMORPHOUS AND CRYSTALLINE GROUP V ELEMENTS Ph.D. Thesis
Benjamin Victor Shanabrook 1981 134 p
Avail: Univ. Microfilms Order No. 8112834

First and second order Raman scattering measurements of orthorhombic (o-)P and o-As were performed. A scaling relation between the k = 0 phonon frequencies of o-As and o-P as well as a Born model calculation indicate that the near-neighbor force constants are larger in o-P. The excellent agreement between the second order Raman spectrum and a theoretical calculation of o-As suggests the dominance of overtone scattering. Furthermore, the second order Raman spectra suggest that greater phonon dispersion exists in o-As relative to o-P. A larger contribution of covalent bonding exists in o-P. Similarities between the Raman spectra of o-P and a-P were observed. In contrast to earlier suggestions, the structural studies of a-P samples indicate that highly variable intermediate range structural correlations may exist in an amorphous network. These correlations appear related to displacement induced polarizability correlations probed by Raman scattering. Dissert. Abstr.

N82-13934 Purdue Univ., Lafayette, Ind.
RAMAN PROBE OF EQUILIBRIUM AND LASER MODULATED POPULATIONS OF ELECTRONS AND PHONONS IN GaAs Ph.D. Thesis
Dennis Alan Abramsohn 1981 260 p
Avail: Univ. Microfilms Order No. 8123607

The Raman spectrum was used as a probe of the free electron solid state plasma and of the phonons in GaAs. In an effort to elevidate single particle scattering (essentially Compton scattering from a Maxwellian distribution of electrons), manifested as a Gaussian wing around the laser line (the Rayleigh wing). A high intensity pulsed YAG laser photoexcited carriers from deep traps. The same laser pulse also probed the new carrier distribution. A computer controlled Raman scattering system was developed which made gated, high intensity measurements during Q-switched laser excitation and obtained excellent low intensity spectra. From the high intensity measurements, light scattering from excess carriers photoexcited from deep traps in GaAs was observed and the possibility of studying non-equilibrium populations of electrons by pulsed laser techniques was demonstrated. The analysis of the Rayleigh wing lineshape at low intensity led to several new and interesting results which are discussed. Dissert. Abstr.

N82-13935 Ohio State Univ., Cleveland.
AN INVESTIGATION OF SOME MAGNETIC PROPERTIES OF CALCIUM SUBSTITUTED YTTRIUM IRON GARNET FILMS Ph.D. Thesis
Liang-Choo Hsia 1981 193 p
Avail: Univ. Microfilms Order No. 8121804

The properties of Calcium substituted Yttrium Iron Garnet were investigated using ferromagnetic resonance techniques. The samples used were grown by liquid phase epitaxy on [111] oriented Gd3Ga5O12 substrates. The exchange stiffness constant was studied as a function of temperature for both the virgin and reduced states, and the results are consistent with the double exchange mechanism. The exchange stiffness constant has also been studied as a function of oxygen vacancy concentration and the results indicate a definite correlation between the two. It was found that the reduction process induces an easy plane uniaxial anisotropy energy and the measured values are in reasonable agreement with those calculated from the crystal field theory. It is believed that oxygen vacancy ordering is responsible for the induced uniaxial anisotropy energy. Magnetostatic modes were observed on reduced films with a thickness 16 microns. Dissert. Abstr.

N82-13936 Northwestern Univ., Evanston, Ill.
LOCAL DENSITY STUDIES OF ELECTRONIC STRUCTURE AND BONDING IN TRANSITION METAL COMPOUNDS Ph.D. Thesis
Cyrus Jehangir Umrigar 1981 181 p
Avail: Univ. Microfilms Order No. 8125027

Self consistent calculations with local exchange correlation potentials were performed on the transition metal compounds NbO2 and TiS2. NbO2 was treated by the molecular cluster method, in which the wavefunctions of a finite cluster of atoms extracted from the solid are explicity calculated and effects of the rest of the solid are taken into account by embedding the cluster in a crystal field. NbO6 and Nb3O6 clusters were treated and the electronic energy levels were compared with experimental data and with non self-consistent band structure results. TiS2 crystallizes in a layered structure that consists of S-Ti-S sandwiches, that are internally strongly bonded, but have weak intersandwich interaction. The band structure and density of states (DOS) of a single sandwich, double sandwich and the bulk were calculated by the linearized augmented plane wave method and compared with each other. Dissert. Abstr.

N82-13937 Northwestern Univ., Evanston, Ill.
NONLINEAR OPTICAL EFFECTS IN LIQUID CRYSTALS Ph.D. Thesis
Santosh Kumar Saha 1981 111 p
Avail: Univ. Microfilms Order No. 8124999

Direct current field induced optical second harmonic generation in nematic and cholesteric liquid crystals is investigated. In addition, flexoelectric induced second harmonic generation in nematic MBBA is studied. The experiments involve the detection of optical radiation at second harmonic frequency when aligned thin film liquid crystals samples are irradiated with laser beam at the fundamental frequency. The laser used is a Q switched Nd YAG laser. Sample alignment is achieved either with rubbing technique or by coating glass spacers with 100 A thick of SiO2. Experiments on nematic liquid crystals show that the temperature dependence of nematic order parameters is obtained from the measurement of dc induced second harmonic generation. Flexoelectric effect gives rise to second harmonic generation in nematic liquid crystal and the birefringence of nematic crystal is used to achieve phase matching. Dissert. Abstr.

N82-13938 Northwestern Univ., Evanston, Ill.
PHASE SEPARATION OF A TWO COMPONENT ELECTRON-HOLE LIQUID IN (111) STRESSED Ge Ph.D. Thesis
Jagmohan Bajaj 1981 123 p
Avail: Univ. Microfilms Order No. 8124849

The possibility of phase separation of an electron-hole drop (EHD) containing both hot and cold electrons in < 111 > stressed

Ge was investigated. It is predicted theoretically that in Ge under appropriate < 111 > uniform stress and at low temperatures, hot and cold electrons are uniformly distributed inside EHD only if the ratio x of the total number of hot electrons to that of cold electrons is larger than a certain critical ratio x sub c. However, for x less than x sub c the system should phase separate into two coexisting phases with quite different x ratio. Time resolved luminescence spectroscopy was used to probe this phase separation. Dissert. Abstr.

N82-13939 Missouri Univ. -Rolla.
BORON IMPLANTED STRONTIUM TITANATE Ph.D. Thesis
Connie Jeanne McDonald Cooper 1981 120 p
Avail: Univ. Microfilms Order No. 8123581

Single crystals of strontium titanate implanted with boron were found to have highly conductive surface layers. The effects of varying dose from 10 to the 16th power to 10 to the 17th power ions/sq cm, implantation voltage from 50 to 175 keV and annealing conditions on the room temperature surface resistance and Hall mobility are presented. Variation of the implantation voltage did not have a major effect on the sheet resistances obtained by boron implantation of strontium titanate, while dose and annealing conditions have major effects. Doses of 5 x 10 to the 16th power ions/sq cm required annealing on the order of one hour at 500 K for maximum reduction of the room temperature resistance in the implanted layer. Samples implanted with a dose of 1 x 10 to the 17th power ions/sq cm required slightly higher temperatures (approximately 575 K) to obtain a minimum resistance at room temperature. Long term (several weeks) room temperature annealing was found to occur in high dose samples. After one to two months at room temperature followed by an anneal to 575 K, the surface resistances were found to be lower than those produced by the annealing of a freshly implanted sample to 575 K.
Dissert. Abstr.

N82-13940 Temple Univ., Philadelphia, Pa.
FLUORESCENT GUEST-HOST EFFECT IN SCATTERING LIQUID CRYSTALS AND NEW PHYSICAL PHENOMENA IN THIN LIQUID CRYSTAL FILMS Ph.D. Thesis
Aharon Hochbaum 1980 190 p
Avail: Univ. Microfilms Order No. 8124545

Fluorescence emission of guest molecules in cholestric liquid crystal hosts was modulated by an electric-field-induced cholesteric-nematic transition. The contrast ratio between the emissions from the two states is affected primarily by the scattering properties of the phase and the order parameter of the guest. Data are presented on the dependence of the contrast ratio the cell parameters and the structure of both guest and host. A simple model is presented accounting for the observed behavior. The feasibility of growing thin liquid crystal films, via thermal evaporation, was demonstrated. In sub-micron films a departure from bulk behavior was observed; the orientation of smectic layers was found to depend on temperature and thickness; nematic films show a two-domain pattern which we interpreted as two opposite spontaneous twists; phase transition temperatures showed large, thickness dependent depressions; deep supercooling effects in thin films reveal new phases (most likely smectic) that are absent from the bulk phase diagram. Dissert. Abstr.

N82-13941 Stanford Univ., Calif.
LONG-RANGE INTERACTIONS IN LATTICE FIELD THEORY Ph.D. Thesis
Jeffrey Mark Rabin 1981 139 p
Avail: Univ. Microfilms Order No. 8124137

Lattice quantum field theories containing fermions can be formulated in a chirally invariant way provided long-range interactions are introduced. In weak coupling perturbation theory such a lattice theory is renormalized when the corresponding continuum theory is recovered in the perturbative continuum limit. In the strong-coupling limit of these theories, an effective Hamiltonian describing a Heisenberg antiferromagnet with long-range interactions is studied. A critical rate of falloff of the interactions, approximately as inverse distance squared, which separates a nearest-neighbor-antiferromagnetic phase from a phase displaying identifiable long-range effects is found. A duality-type symmetry which is present in some block-spin calculations is pointed out. Dissert. Abstr.

N82-13942 Stanford Univ., Calif.
UPPER CRITICAL FIELDS AND SPAN STATES IN A-15 SUPERCONDUCTORS, PART 1. VORTICES IN TWO-DIMENSIONAL SUPERCONDUCTORS, PART 2 Ph.D. Thesis
Terry Philip Orlando 1981 195 p
Avail: Univ. Microfilms Order No. 8124125

The upper critical fields of niobium-tin and vanadium-silicon were measured and analyzed within the Ginzburg-Landau-Abrikosov-Gor'kov theory of type 2 superconductivity. The importance of many-body effects on the spin states of the superconductor is stressed, especially the renormalization of the Pauli paramagnetic limiting process. For niobium-tin failure to include renormalizations from the electronphonon interaction leads to too high spin-orbit scattering rates. For a similar A15 compounds vanadium-gallium failure to include renormalizations from the electron-electron interaction (spin-fluctuations and the related Stoner factor) leads to a measured upper critical field a zero temperature which is lower than theoretically allowed. The phase transition of Kosterlitz and Thouless, in which bound pairs of positive and negative vortices dissociate at a characteristic temperature, is shown to be possible for thin superconducting films. The resistance in the superconductor caused by this dissociation is compared to that caused by thermally activated vortices and by current-induced phase slips. Dissert. Abstr.

N82-13943 Stanford Univ., Calif.
CW LASER ANNEALING AND CW LASER ASSISTED DIFFUSION IN GALLIUM ARSENIDE Ph.D. Thesis
Yves Isaac Nissim 1981 167 p
Avail: Univ. Microfilms Order No. 8124120

It is demonstrated that lasers or electron beams are very attractive tools to process semiconductors. They provide a rapid localized heating of the surface of the semiconductor to precisely control its temperature. As a result it is possible to completely anneal ion implanted silicon and to induce various reactions. Gallium arsenide is a promising potential candidate for laser processing since conventional thermal treatments are not yet fully satisfactory. The annealing of ion implanted gallium arsenide using laser techniques was investigated and some mechanisms that enhance the recovery of the lattice and the activation of the dopants were identified. Then as a substitute to ion implantation, CW laser irradiation was used to diffuse dopants in gallium arsenide from surface sources to create thin n+ layers. These diffused layers were optimized to form nonalloyed ohmic contacts that were successfully utilized in the fabrication of different GaAs metal semiconductor field effect transistor structures. Dissert. Abstr.

N82-13944 Stanford Univ., Calif.
ELECTRON BEAM EVAPORATION OF SUPERCONDUCTING, A15 NIOBIUM-SILICON Ph.D. Thesis
Robert David Feldman 1981 180 p
Avail: Univ. Microfilms Order No. 8124063

Niobium-silicon compounds with the A15 crystal structure have been of interest for the possibility that they would have superior superconducting properties. The maximum superconducting transition temperature is expected to occur for a well-ordered A15 phase containing 25 atomic percent silicon. The A15 phase does not appear in the niobium-silicon equilibrium phase diagrams, so the structure must be synthesized by nonequilibrium means. Electron beam evaporation has been used to synthesize A15 niobium-silicon films. The addition of oxygen during evaporation stabilizes the A15 structure, and permits the formation of a homogeneous, well-ordered, single-phase film for compositions up to approximately 18.5 atomic percent silicon. The maximum transition temperature is 8.3 K. In order to understand the role played by oxygen, metastable phase diagrams were prepared, and the initial growth to films was studied as a function of substrate temperature and oxygen pressure.
Dissert. Abstr.

N82-13945 Wisconsin Univ. - Madison.
COMPOSITION DEPENDENCE OF NEODYMIUM OPTICAL HOMOGENEOUS LINEWIDTHS IN GLASSES Ph.D. Thesis

John Michael Pellegrino 1981 133 p
Avail: Univ. Microfilms Order No. 8117528

Various host media were surveyed in order to ascertain the dependence of the optical homogeneous linewidth upon host velocity of sound and system temperature. Measurements are made for Nd(+3) in oxide and fluoride based glasses for host composition ranging from simple binary to multicomponent glasses. Line broadening processes active in crystalline systems to lay the groundwork for the glass investigations are reviewed. A LiF:F2+ color center laser provided excitation for the observation of fluorescence. Homogeneous linewidths at 300 K exhibit a broad range of values, varying by approximately a factor of four. The ratio of homogeneous to inhomogeneous linewidth also varies over a broad range, from 0.16 for a sodium barium borate glass to 1.86 for a rubidium phosphate glass. The homogeneous linewidth is inversely dependent to the 2.6 power of the velocity of sound from host to host. Results strongly suggest that the Raman process is responsible for a major portion of the glass linewidth in the high temperature regime.
Dissert. Abstr.

N82-13946# Aerospace Corp., El Segundo, Calif. Electronics Research Lab.
STATISTICAL ANALYSIS OF ACCELERATED TEMPERATURE AGING OF SEMICONDUCTOR DEVICES Interim Report
Walter A. Johnson and Michael F. Milles 15 May 1981 51 p refs
(Contract F04701-80-C-0081)
(AD-A099439; TR-0081(6930-02)-1; SD-TR-81-37) Avail: NTIS HC A04/MF A01 CSCL 20/12

A number of semiconductor devices taken from a distribution were operated at several elevated temperatures to induce failure in all devices within a reasonable time. Assuming general characteristics of the device failure probability density function (pdf) and its temperature dependence, the expected cumulative failure function (cff) for devices in normal operation were estimated based on statistical inference, taking the average probability of a random device (from the same distribution but operated at a normal temperature) failing as a function of time. A review of the mathematical formalism employed in semiconductor reliability discussions is included. Three failure pdf's at particular usefulness to this analysis--exponential, normal, and lognormal - are discussed. The cff, at times orders of magnitude loss then, at times comparable to the desired system useful, life (*10 to the 4th power to 10 to the 5th power hr) is considered. A review of accelerated temperature aging is presented, and the assumption concerning the general characteristics of the failure pdf, which are fundamental to this analysis, are emphasized. Author

N82-13947# Spire Corp., Bedford, Mass.
HgCdTe FABRICATION USING DIRECTED ENERGY TECHNIQUES Final Report
Anton C. Greenwald and John Miles Aug. 1981 97 p refs Prepared in cooperation with New England Research Center, Inc.
(Contract MDA903-79-C-0434; DARPA Order 3800)
(AD-A105626; FR-81-10071) Avail: NTIS HC A05/MF A01 CSCL 20/7

The goal of this research is to produce large-area, thin-film, single crystal mercury cadmium telluride material for infrared detectors. The successful approach is to (1) evaporate cadmium telluride in an enclosed furnace on insulating crystalline substrates (hot wall epitaxy), (2) melt a thin surficial layer by pulsed electron beam irradiation to improve morphology, and (3) convert to mercury cadmium telluride by evaporation and diffusion at constant temperature. The final result is a single crystal film of Hg (sub 1-x) Cd sub x Te, 30 microns thick and 0.5 inch square, with a compositional variation of x less than + or - 0.0007. Films of up to 20 microns thick, 1 inch o.d., single crystal (but twinned) CdTe were produced by the first process. These faceted films were smoothed without change of surface stoichiometry or structure by the second process. Evaporation of HgTe at less 0.5 atm Hg overpressure onto the CdTe film produced the final result on mica or quartz substrates. Electron mobility at 77 K was as high as 1.5 x 10 to the 5th power sq cm/V-s in the final samples. GRA

N82-13948# California Univ., Livermore. Lawrence Livermore Lab.
SHOCK ANOMALY AND S-D TRANSITION IN HIGH-PRESSURE LANTHANUM
A. K. McMahan, H. L. Skriver (Research Establishment, Roskilde, Denmark), and B. Johansson (Aarhus Univ.) 23 Jul. 1981 7 p refs Presented at the Intern. Symp. on the Phys. of Solids Under High Pressure, Bad Honnef, West Germany, 10-14 Aug. 1981
(Contract W-7405-eng-48)
(DE81-027659; UCRL-86484; CONF-810828-2) Avail: NTIS HC A02/MF A01

Linear muffin-tin orbital calculations of the band structure and pressure volume isotherms for fcc La, both at zero and finite temperatures are presented. The calculated bulk modulus shows a rapid stiffening in the range from 40 to 50 percent compression, due to termination of the 6s to 5d electronic transition. When combined with a simple Slater model analysis, these results yield a temperature dependent peak in the lattice Gruneisen parameter. Experimental confirmation of this peak is found in an anomalous stiffening seen in the shock compression data for La, and it may also have some bearing on the observed saturation of the superconducting transition temperature in La around 200 kbar. DOE

N82-13949# Illinois Univ., Urbana. Dept. of Physics.
DEFECT STUDIES OF MOLECULAR AND RARE-GAS CRYSTALS DOWN TO 50mK AND UP TO 150 MPa
R. O. Simmons 1981 14 p refs Presented at Am. Crystallographic Assoc. Meeting, College Station, Tex., Mar. 1980
(Contract DE-AC02-76ER-01198)
(DE81-026617; DOE/ER-01198/135) Avail: NTIS HC A02/MF A01

Phase transitions arising from changes in molecular rotational ordering in solid CH4 and CD4 and lattice parameters during sublimation and melting of solid Ar, Kr, and Xe have thus been studied. The symmetries of the different phases below 1 K of the system solid ortho- and para-H were determined and He3-He4 mixtures below 0.4 was investigated using coherent scattering techniques. DOE

N82-13950# New Mexico Univ., Albuquerque.
OBSERVATION OF HIGH FIELD DHVA EFFECT AND INDUCED MAGNETISM IN SINGLE CRYSTAL TiBe SUB 2
A. P. J. vanDeursen, J. M. VanRuitenbeek, W. A. Verhoef, A. R. deVroomen, J. L. Smith, R. A. Groot, D. D. Koelling, and F. M. Muller 1981 3 p refs Presented at the 26th Intern. Conf. on Low Temp. Phys. LT-16, Los Angeles, 19-25 Aug. 1981 Submitted for publication
(Contract W-7405-eng-36)
(DE81-025292; LA-UR-81-1664; CONF-810809-12) Avail: NTIS HC A02/MF A01

Recently much interest has been given to itinerant magnetism in cubic Laves phase or C15 materials. Primarily this stems from the discussion of the relationship of p state pairing and ferromagnetism in ZrZn2 by Enz and Matthias, and the possibility of triplet superconductivity. The most recent work in this field has focused on the isoelectronic, isostructural material TiBe sub 2 and the possibility that this material is metamagnetic. That TiBe sub 2 is close to some form of magnetic instability can be inferred indirectly from the peaked nature of its density of states near the fermi level, but also from the observation of ferromagnetism in TiBe/sub 2-x/Cu/sub x/, when x is greater than about 0.15. In this paper a single crystal of pure TiBe sub 2 is considered in fields larger than 15 Tesla (T) and at a temperature of 1.3 K. DOE

N82-13951# Hanford Engineering Development Lab., Richland, Wash.
HELIUM DIFFUSION IN IRRADIATED BORON CARBIDE
G. W. Hollenberg Mar. 1981 18 p refs Presented at the 83rd Symp. on Nucleation and Crystallization in Glasses, Washington, D.C., 3-6 May 1981; sponsored by the American Ceramic Society
(Contract DE-AC14-76FF-02170)
(DE81-027848; HEDL-SA-2236-FP; CONF-810528-10) Avail: NTIS HC A02/MF A01

Instrumented irradiation experiments in EBR 2 providing continuous helium release data on boron carbide at a variety of operating temperatures are described. Although some microstructural and compositional variations were examined in these experiments most of the boron carbide was prototypic of that used in the Fast Flux Test Facility. The density of the boron carbide pellets was approximately 92% of theoretical. The boron carbide pellets were approximately 1.0 cm in diameter and possessed average grain sizes that varied from 8 to 30 microns. Pellet centerline temperatures were continually measured during the irradiation experiments. DOE

N82-13952# Oak Ridge National Lab., Tenn.
ROLE OF ELECTRON SWARM STUDIES IN THE DEVELOPMENT OF GASEOUS DIELECTRICS
L. G. Christophorou 1981 17 p refs Presented at the 2nd Intern. Swarm Seminar, Oak Ridge, Tenn., 22 Jul. 1981
(Contract W-7405-eng-26)
(DE81-026349; CONF-810720-2) Avail: NTIS HC A02/MF A01

Recent knowledge provided by swarm studies allowing control of the number densities and energies of free electrons in electrically stressed gases is highlighted. This knowledge aided the discovery of new gas dielectrics and the tailoring of gas dielectric mixtures. The role of electron attachment in the choice of unitary gas dielectrics or electronegative components in dielectric gas mixtures, and the role of electron scattering at low energies in the choice of buffer gases for mixtures is outlined. DOE

N82-13953# Oak Ridge National Lab., Tenn.
EFFECTS OF PRESSURE ON THE MIXED VALENT PROPERTIES OF Ce AND ITS INTERMETALLIC COMPOUNDS
S. H. Liu Jul. 1981 9 p refs Presented at Conf. on High Pressure Phys., Bad Honnef, West Germany, Aug. 1981
(Contract W-7405-eng-26)
(DE81-028572; CONF-810828-5) Avail: NTIS HC A02/MF A01

A systematic high pressure study of intermetallic compounds of Ce is proposed to elucidate the phenomenon of valence fluctuations. For these materials, the single parameter which is most sensitive to the pressure is the position of the Ce 4f level relative to the conduction bands. Therefore, it should be possible to monitor the valence with pressure and follow the evolvement of the system from a local moment state to a nonmagnetic state. The latter may be a spin compensated Kondo lattice state of a lattice of virtual bound states. The experimental evidence of exotic states is reviewed, and experiments to investigate their physical properties are suggested. DOE

N82-13954# Los Alamos Scientific Lab., N. Mex.
SPECTROMETRIC PROPERTIES OF CRYSTALS FOR LOW-ENERGY X-RAY DIAGNOSTICS
D. M. Barrus, R. L. Blake, H. Felthauser, E. E. Fenimore, and A. J. Burek (NBS, Washington, D.C.) 1981 10 p refs Presented at the Topical Conf. on Low-Energy X-Ray Diagnostics, Livermore, Calif., 8 Jun. 1981
(Contract W-7405-eng-36)
(DE81-028763; LA-UR-81-2283; CONF-810651-4) Avail: NTIS HC A02/MF A01

A summary is presented of several accurately measured parameters for the crystals KAP, RbAP, TlAP, NH4AP, NaAP, ADP, and EDDT including: the interplanar spacing of atoms; the angle correction for normal and anomalous dispersion that is required for application of the Bragg formula; the thermal expansion coefficient near room temperature for commonly used planes; and the integrated coefficient of reflection. DOE

N82-13955# California Univ., Livermore. Lawrence Livermore Lab.
ELECTRON BAND THEORY AND HIGH PRESSURE EQUATION OF STATE
A. K. McMahan 21 Jul. 1981 8 p refs Presented at the 8th AIRAPT Conf. and 19th EHPRG Conf., Uppsala, 17-22 Aug. 1981
(Contract W-7405-eng-48)
(DE81-027436; UCRL-86485; CONF-810827-4) Avail: NTIS HC A02/MF A01

Calculations of the high pressure equation of state of selected materials are reviewed, in order to illustrate general trends which occur in the evolution of electronic structure with compression, and the consequence of these trends for material properties. Elemental solids are reviewed. The manner in which unhybridized energy bands evolve with compression is considered. DOE

N82-13956# Sandia Labs., Albuquerque, N. Mex.
FUNDAMENTAL STUDIES OF GRAIN-BOUNDARY PASSIVATION IN POLYCRYSTALLINE SILICON WITH APPLICATION TO IMPROVED PHOTOVOLTAIC DEVICES
C. H. Seager and D. S. Ginley Aug. 1981 80 p refs
(Contract DE-AC04-76DP-00789)
(DE82-000825; SAND-81-1950) Avail: NTIS HC A05/MF A01

Barrier heights and recombination velocities for silicon grain boundaries were calculated and are shown to be in good agreement with transpot measurements on uniformly illuminated silicon bicrystals. Improved calculations of the Hall effect in polycrystalline solids are also presented along with assessments of the ability of effective circuit models to account for the anomalously low carrier concentrations measured in small grain polycrystalline silicon. Preliminary optimization of some new methods for hydrogen passivation was completed. Almost complete removal of EBIC grain boundary losses can now be achieved in times as short as twenty minutes. Progress was made in the identification and characterization of infrared vibrational modes associated with grain boundary-bonded hydrogen. The effects of fluorine and oxygen treatments on silicon grain boundaries were determined. These agents appear to increase grain boundary potential barrier heights in n-type silicon in marked contrast to the effect of hydrogen. DOE

N82-13957# Siemens A.G., Munich (West Germany). Werk fuer Roehren und Sondergebiete.
MULTIFUNCTIONS - LIQUID CRYSTAL DISPLAYS Final Report
Martin Bechteler Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 68 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-181; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13.90

Large area liquid crystal displays up to 400 cm square were developed capable of displaying a large quantity of analog and digital information, such as required for car dashboards, communication systems, and data processing, while fulfilling the attendant requirements on view tilt angle and operating temperature range. Items incorporated were: low resistance conductive layers deposited by means of a sputtermachine, preshaped glasses and broken glassfibers, assuring perfect parallellism between glass plates, rubbed plastic layers for excellent electrooptical properties, and fluorescent plates for display illumination in bright sunlight as well as in dim light conditions. Prototypes are described for clock and automotive applications. Author (ESA)

N82-13958# Virginia Polytechnic Inst. and State Univ., Blacksburg.
COMPUTER PROGRAMS FOR LINE SHAPE ANALYSIS OF X-RAY DIFFRACTION PEAKS
T. M. Smith and C. R. Houska Dec. 1980 100 p refs Prepared in cooperation with Tektronix, Inc., Beaverton, Oreg.
(Grant NSF DMR-75-17201)
(PB81-227787; VPI-E-81-19) Avail: NTIS HC A05/MF A01 CSCL 20B

Modifications of the Warren-Averbach line shape analysis and necessary computer programs written in Fortran 4, which perform the analysis, are preentered. Very accurate instrumental broadening parameters are determined by one program. Another program fits the theoretical intensity expression to the experimental data to yield particle size and two strain parameters. Also included are programs which combine the two strain components found in thin films to yield the total mean square microstrain. Sample inputs and outputs for the analysis of a one micrometer thick Mo film sputter deposited onto a (111)-oriented Si single crystal substrate are given. Descriptions of the programs as well as detailed procedures for their use are included. GRA

N82-13959 Northwestern Univ., Evanston, Ill.
DEFECT STRUCTURE AND PROPERTIES OF INTERMETALLIC COMPOUND BETA-LiAl Ph.D. Thesis
Kohji Kishio 1981 162 p
Avail: Univ. Microfilms Order No. 8124926

The defect structure of the NaTl-type intermetallic compound beta-LiAl and its doped alloys was studied through X-ray lattice parameter, bulk density as well as NMR spin-lattice relaxation rate measurements. The lattice parameter of slowly cooled LiAl alloys was found to vary almost linearly within the composition range of the beta-phase. A defect model which consists of the coexistence of two types of point defects was proposed and their concentrations were determined as a function of composition. The observations suggested a model in which the concentration of vacancies on the Li sublattice decreased while that of the Li antistructure atoms on the Al sublattice increased with Li composition. The average number valance electrons per lattice site was calculated and it was found it would not exceed 2.0 even at Li poor side of the composite due to the formation of a defect lattice. This behavior has been interpreted in the light band structure, and a correlation of the defect structure with the electronic structure in NaTl-type compounds was hypothesized. Dissert. Abstr.

N82-13960 Rochester Univ., N. Y.
PUSH-PULL FATIGUE OF LiF AND MgO SINGLE CRYSTALS Ph.D. Thesis
Bhaskar Sinha Majumdar 1980 250 p
Avail: Univ. Microfilms Order No. 8123990

The mechanical and microstructural response of LiF and MgO, subjected to push-pull cyclic deformation was studied as a function of strain amplitude, strain rate and temperature. Comparisons are made with the fatigue behavior of i.c.c., b.c.c. and h.c.p. metals. At room temperature the fatigue hardening of LiF is rapid and almost linear per cycle. The flow stress rises to as much as ten times the original yield stress. Based on a concept of cumulative strain, excellent agreement was obtained between the hardening rates in fatigue and in monotonic deformation. The fatigue analysis, which separates long and short range stresses, explains why LiF in fatigue can withstand larger applied stresses before fracture when compared to unidirectional tensile deformation. Dissert. Abstr.

N82-13961 Florida Univ., Gainesville.
ELECTRIC FIELD-ENHANCED DIFFUSION AND ELECTRON STIMULATED DESORPTION OF ALKALI ELEMENTS FROM GLASS SURFACES DURING ELECTRON BOMBARDMENT AND AUGER ELECTRON ANALYSIS Ph.D. Thesis
Fumio Ohuchi 1981 153 p
Avail: Univ. Microfilms Order No. 8124448

Among a number of modern surface sensitive analytical techniques, Auger electron spectroscopy (AES) is extensively applied for glass surface research because of its superior characteristics. AES is generally considered as a nondestructive technique; however, a number of reports have shown that the incident electron beam can alter the surface composition of the solid being analyzed. Compositional changes in glass is particularly severe in glasses containing alkali ions and it is manifested by the time dependent alkali Auger signal loss during electron bombardment. The fundamental mechanisms of alkali Auger signal loss from glass surfaces during electron bombardment are described. It is shown that this is the result of electric field enhanced diffusion and electron stimulated description.
Dissert. Abstr.

N82-13962 Pennsylvania Univ., Philadelphia.
THE STRUCTURE AND PROPERTIES OF GRAIN BOUNDARIES Ph.D. Thesis
Adrian Peter Sutton 1981 405 p
Avail: Univ. Microfilms Order No. 8117861

Long period symmetrical and asymmetrical tilt boundaries in aluminum and copper were studied. Two classes of grain boundaries were found favoured which consist of a contiguous sequence of primary dislocations whose long range elastic fields cancel and nonfavoured which exist in the misorientation ranges between favoured boundaries and are composed of units of the neighboring favoured boundaries. A crystallographic analysis of tilt boundaries reveals the relationship between them through faceting or dislocation formation. This analysis is readily applied to atomistic calculations of long period asymmetrical tilt boundaries. Three previous atomistic studies of tilt boundary structure are reinterpreted and several fundamental difference between intrinsic and extrinsic grain boundary dislocations are described. A preliminary atomistic study of grain boundaries containing impurities was made using silver and bismuth atoms which were introduced subsitutionally into favoured and nonfavoured boundaries in copper. A strong tendency for segregation of bismuth to both boundaries is found while only a small tendency (sometimes none) is found for silver. Dissert. Abstr.

N82-13963 Florida Univ., Gainesville.
TRANSPORT NOISE ARISING FROM DIFFUSION AND BULK OR SURFACE GENERATION RECOMBINATION IN SEMICONDUCTORS Ph.D. Thesis
Harshad Mehta 1981 141 p
Avail: Univ. Microfilms Order No. 8124442

The type of noise spectra in solids or solid state devices, which can arise from noise due to a combination of causes, such as diffusion of carriers, generation and recombination (g-r) processes of carriers in the bulk and at the surface was studied using techniques to be described apply equally well to the problem of heat diffusion, with heat transfer or reflection at the boundaries of the system, we have, however, mainly the carrier noise problem in mind. The physical noise sources, the diffusion source, g-r source and surface source, Clarke and Voss' P source are discussed as well as transport noise in symmetrical embedded bodies, in nonsymmetrical embedded bodies, in symmetrical nonembedded bodies and in nonsymmetrical nonembedded bodies. Results indicate that volume g-r and diffusion processes give rather smooth spectra, but, without a 1/f range. The high frequency asymptote is always w-3/2 (embedded case) or omega to the minus 2 power (nonembedded case). Dissert. Abstr.

N82-13964 Stanford Univ., Calif.
THE PHYSICAL AND ELECTRICAL PROPERTIES OF POLYCRYSTALLINE-SILICON Ph.D. Thesis
Mohammad Mahmoud Mandurah 1981 161 p
Avail: Univ. Microfilms Order No. 8124106

The detailed characterization of the physical and electrical properties of polycrystalline-silicon is essential to ensure the proper design and reliable performance of the devices in which this material is used. Modeling of electrical conduction is critical for predicting the effects of the processing cycles on their electrical properties. The physical and electrical properties of low-pressure chemically-vapor-deposited silicon films are characterized and are then related to each other to develop a new model for electrical conduction. The structure of the LPCVD films strongly depends on deposition conditions. Below the critical deposition temperature of 580 C, the deposited films are amorphous, highly unstable, and recrystallize easily after high-temperature annealing. Enhanced grain growth is detected as a result of heavy doping and/or annealing at elevated temperatures. The electrical properties of these films strongly depend on dopant concentration and species and processing. Carrier reflection at the grain boundaries (neglected in models) is demonstrated to be an important mechanism that, combined with carrier trapping and dopant segregation, controls electrical conduction in polycrystalline-silicon. Dissert. Abstr.

N82-13965 Nebraska Univ. - Lincoln.
THE GROWTH AND CARRIER TRANSPORT PROPERTIES OF SPUTTER DEPOSITED GaAs THIN FILMS DOPED WITH SILICON AND MAGNESIUM Ph.D. Thesis
Dan Michael Mosher 1981 153 p
Avail: Univ. Microfilms Order No. 8124519

Thin films of GaAs were deposited with a triode sputtering system onto single crystal GaAs semiinslating substrates. Most of the films were doped by the cosputtering of Si for n type or Mg for p type films. The electrical resistivity and Hall Effect were measured by the van der Pauw technique to obtain the carrier concentration and mobility as a function of temperature. Analysis of these data determined that the dopant energy levels had created a band which merged with the production band. The characteristics of this merged band structure controlled the free carrier concentration. It was determined that the dopant density was controlled by the duty cycle of the bias voltage on

the dopant target. The resistivity of the n type films at room temperature ranged from 0.036 Ohm cm to 20.8k Ohm cm. The most important mobility limitations were found to be ionized impurity scattering from the high doping densities and grain boundary scattering from the film disorder. The average grain size was determined from grain boundary scattering analysis to be about 50 to 100 A. Dissert. Abstr.

N82-13966 Northwestern Univ., Evanston, Ill.
A STOCHASTIC LANGEVIN DYNAMICS STUDY OF CORRELATED IONIC MOTION IN ONE-DIMENSONAL FRAMEWORK SOLID ELECTROLYTES Ph.D. Thesis
Solomon Howard Jacobson 1981 227 p
Avail: Univ. Microfilms Order No. 8124913

The microscopic motion of charge carriers in one-dimensional framework ionic conductors is described by stochastic Langevin dynamics. The interactions of the charge carriers with the framework lattice are approximated by a sum of periodic and random forces, representing the static and dynamic effects of the framework lattice. Ionion interactions are represented by realistic Coulomb and short range forces. Mechanisms for fast ion transport, based on the calculated transport properties in systems where the various constituent factors (forces in the Langevin equation) have been systematically varied, are presented. Independent particle models are examined first. The stochastic Langevin dynamics technique is shown to contain the correct low frequency and high frequency behavior. Comparison of stochastic Langevin dynamics with the Smoluchowski equation is presented. Results at several different values of the damping constant define the criteria for which the Smoluchowski approximation is valid. Dissert. Abstr.

N82-13967 Stanford Univ., Calif.
EXPERIMENTAL AND THEORECTICAL STUDIES OF EXCITED STATE TRANSPORT Ph.D. Thesis
Craig Robert Gochanour 1981 177 p
Avail: Univ. Microfilms Order No. 8124074

The spatial transport of electronic excited state energy was examined. The first problem considered is the transport of singlet excited state energy among a set of randomly distributed solute molecules in a host solvent. The effects of the random distribution of spatial positions were studied in a theoretical analysis of the Green function. From the master equation a diagrammatic expansion of the Green function was derived. The second topic considered is the basic nature of the excited states of a pure molecule crystal. The nature of the excited state is an important factor needed to understand transport as a delocalized excited state will lead to coherent, wavelike transport while a localized excited state leads to incoherent, hopping transport. An experimental study of the temperature dependence of the absorption lineshape of the s sub o yields t sub 1 transition in 1,2,4,5-tetrachlorobenzene is presented. Dissert. Abstr.

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

N82-13968 Purdue Univ., Lafayette, Ind.
COMPTON SCATTERING IN A UNIFORM, CONSTANT MAGNETIC FIELD Ph.D. Thesis
Evelyn Smith Kinzel 1981 143 p
Avail: Univ. Microfilms Order No. 8123666

A general expression for the Compton cross section for a uniform, constant magnetic field was derived based on the Dirac equation and second order perturbation theory, the electrons were represented by single particle wave functions and the photons by plane waves. The solution was programmed for numerical solution by computer; the results were displayed graphically. The solution possesses the usual energy conservation for the system of the electron plus the photon; in addition, the component along the magnetic field of the linear momentum of the system is conserved in the magnetic Compton effect. There is no general conservation of momentum. The numberical portion reveals a resonance in the total cross section when the frequency of the incoming photon is near the electron's Larmor frequency. At the Peak, one photon polarization mode exhibits a severe dip for outgoing photons moving perpendicular to the magnetic field. Dissert. Abstr.

N82-13969 California Univ., Los Angeles.
SPECTRAL FUNCTIONS IN QUANTUM CHROMODYNAMICS AND APPLICATIONS Ph.D. Thesis
Minh Dinh Tran 1981 180 p
Avail: Univ. Microfilms Order No. 8122870

The longitudinal and transverse spectral functions for arbitrary conserved and non-conserved vector and axial vector currents of massive quarks are calculated to first order in alpha sub s and exact analytical expressions are given. As an intermediate step the form factors to the same order in alpha sub s are determined. A remarkably simple result is derived for the combination of the spectral functions corresponding to the Weinberg's first sum rule. It behaves asymptotically like alpha sub s/sq s thus ensuring the convergence of the sum rule. The Weinberg's second sum rule is shown to fail to hold, a new sum rule is then proposed to replace the original one. The current algebra calculation of the pion electromagnetic mass difference is reexamined in the light of quantum chromodynamics. The current couplings of five low lying mesons, decay properties of intermediate vector bosons and gluonic corrections to hadronic decay modes are calculated. Implications of the results for decay widths, branching ratios are examined. Dissert. Abstr.

N82-13970 California Univ., Los Angeles.
PROBLEMS IN QUANTUM MECHANICS AND GRAVITATION Ph.D. Thesis
Gregg Darryl Wilensky 1981 117 p
Avail: Univ. Microfilms Order No. 8122087

The rate of spontaneous particle production in the presence of a collapsed star, described by the static Schwarzschild solution to the gravitational field equations was explicity calculated. The calculation of the vacuum persistence probability is based on a semiclassical approximation to the Green's function of a spin O, massless particle in this gravitational field. The singularity in the differential equations at r = 2GM is avoided by giving M, the mass of the star, an infinitesimal imaginary part (motivated by quantum corrections to the gravitational field) whose sign is uniquely determined by the requirement that the vacuum persistence probability should not exceed unity. In contrast to a previous result, particle production is found to occur for this static situation. The value for this rate can not be determined using the semiclassical methods, however, as it is sensitive to the behavior of the Green's function near the classical turning point. Dissert. Abstr.

N82-13971# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
MANUAL FOR THE PROGRAM CASLE: CYCLE ANALYSIS AND SECOND-LIFE EVALUATION
Warren W. Madsen, Janet L. Bogue, C. Dennis McMurtrey, and Scott L. Richlen Apr. 1981 262 p refs
(Contract DE-AC07-76ID-01570)
(DE81-027487; EGG-CS-5351) Avail: NTIS HC A12/MF A01

The user's manual and the computer program CASLE, which models and analyzes Rankine and Brayton cycle systems with regenerator, superheat, and supercritical cycle options is presented. The code has a state point option that will describe any cycle for which the values of pressure and temperature at each state point are known. The code generates the required thermodynamic properties internally using only a few input constants for fluids that are either internal or external to the code. The program version presented is written in Dartmouth BASIC Language and intended for use with the Tektronix 4052 computer. DOE

N82-13972# California Univ., Berkeley. Lawrence Berkeley Lab.
NUCLEAR SLAB COLLISION IN A RELATIVISTIC QUANTUM FIELD THEORY

K. H. Mueller Jun. 1981 10 p refs Presented at the 5th High Energy Heavy Ion Study, Berkeley, Calif. 18-22 May 1981 (Contract W-7405-eng-48)
(DE81-028132; LBL-12893; CONF-8105104-3) Avail: NTIS HC A02/MF A01

Starting from Walecka's Lagrangian, the nucleons are represented by single particle spinors, which are determined by a Dirac equation containing a repulsive mean neutral vector field V/sub mu/ and an attractive mean isosclar field sigma. Both fields satisfy Klein-Gordon equations. Their source terms are again determined by the spinors. This relativistic mean field model was applied to the dynamics of two colliding slabs. They are translational invariant in two transverse dimensions and consist of spin and isospin symmetric nuclear matter. By specification of appropriate initial conditions for the collision of two equal slabs, the system of coupled Klein-Gordon-Dirac equations was solved for lab bombarding energies per nucleon up to 400 MeV. At low energies the results are identical with TDHF results. The damping of the collisions, the phenomenon of high nuclear density, and the effect of retardation during the reaction are studied. DOE

N82-13973 Rochester Univ., N. Y.
NEW EXACT AND ASYMPTOTIC SOLUTIONS OF THE STATIONARY VACUUM EINSTEIN EQUATIONS Ph.D. Thesis
Prasun Kumar Kundu 1980 124 p
Avail: Univ. Microfilms Order No. 8123984

A projection tensor calculus is described for treating spacetimes with two commuting Killing vectors and its use is illustrated by two examples--an alternative proof of a sufficient condition for such a spacetime to be orthogonally transitive (Papapetrou's Theorem) and an application to the Rainich-Misner-Wheeler (RMW) geometrization of the electromagnetic field. A special null tetrad is introduced which is naturally adapted to the group orbits and the components of the Weyl tensor vas examined in this basis. This framework is applied to investigate the admissible Petrov types in the special case when the group orbits admit orthogonal two-surfaces. The new formalism is employed to obtain a class of noncanonical stationary axisymmetric vacuum metrics whose Killing orbits do not admit orthogonal two-surfaces. A metric is found which is Petrov type 2 with expansion-, twist-, and the shear-free geodesic rays and which includes the van Stockum solution as a limiting case. A multipole expansion scheme is also introduced for a wide class of stationary, asymptotically flat, vacuum solutions of Einstein's equations using the conformal techniques of Geroch and Hansen. Dissert. Abstr.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

No abstracts in this category.

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N82-13974# Naval Postgraduate School, Monterey, Calif.
COMPILATION OF ABSTRACTS OF DISSERTATIONS THESES, AND RESEARCH PAPERS SUBMITTED BY CANDIDATES FOR DEGREES, 1 OCTOBER 1979 - 30 SEPTEMBER 1980
Mar. 1981 514 p
(AD-A104124; NPS-012-81-002PR) Avail: NTIS HC A22/MF A01 CSCL 05/2

Abstracts are presented of works submitted in fulfillment of degree requirements in the area of aeronautical, electrical, and mechanical engineering as well as in applied mathematics, applied sciences, and computer sciences. Author

N82-13975# Naval Postgraduate School, Monterey, Calif.
A SUMMARY OF THE NAVAL POSTGRADUATE SCHOOL RESEARCH PROGRAM Summary Report, 1 Oct. 1979 - 30 Sep. 1980
Apr. 1981 528 p
(AD-A104112; NPS-012-81-003PR) Avail: NTIS HC A23/MF A01 CSCL 05/2

Two hundred thirty research projects are summarized in the following areas: computer science; mathematics; administrative sciences; defense resources management; operations research; national security affairs; physics and chemistry; electrical engineering; meteorology; aeronautics; oceanography; and mechanical engineering. Author

N82-13976# Young (Arthur) and Co., Washington, D. C.
MANAGING INFORMATION TECHNOLOGY CHANGE IN THE DECADE OF THE 80'S Final Report
Jack R. Borsting, Jack Brooks, and Charles P. Lecht Jan. 1981 65 p Proceedings of the DOD Long Range ADP Planning Conf., Washington, D.C., 28-29 Jan. 1981
(Contract MDA903-79-C-0690)
(AD-A099441; Rept-0690-005A) Avail: NTIS HC A04/MF A01 CSCL 05/2

Abstracts of 21 presentations on automatic data processing management changes and impact expected during this decade are presented. Five conference panels were conducted and addressed the following themes: information resource management; trend projections and ADP policies for the 80's; program management; management/technical considerations; and office automation. Author

N82-13977# Oak Ridge National Lab., Tenn. Chemical Technology Div.
SEPARATIONS SCIENCE DATA BASE: AN ABSTRACTOR'S MANUAL
J. W. Roddy, W. J. McDowell, and D. C. Michelson Jul. 1981 25 p refs
(Contract W-7405-eng-26)
(DE81-029101; ORNL/TM-7805) Avail: NTIS HC A02/MF A01

The Separations Science Data Base, designed specifically for the retrieval of information needed in chemical separations problems is described. The procedure for entering records into the data base is given. The initial entries are concerned primarily with liquid-liquid extraction and liquid-solid ion exchange methods for metal ions and salts; however, the data base is constructed so that almost any separations process can be accommodated. DOE

N82-13978# General Atomic Co., San Diego, Calif.
DATA MANAGEMENT IN A FUSION ENERGY RESEARCH EXPERIMENT
A. Glad, D. Drobnis, and B. McHarg Jul. 1981 33 p refs
(Contract DE-AT03-76ET-51011)
(DE81-027932; GA-A-16272) Avail: NTIS HC A03/MF A01

Present-day fusion research requires extensive support for

the large amount of scientific data generated, bringing about three distinct problems computer systems must solve: (1) the processing of large amounts of data in very small time frames; (2) the archiving, analyzing, and managing of the entire data output for the project's lifetime; (3) the standardization of data for the exchange of information between laboratories. The computer system supporting General Atomic's Doublet III Tokamak, a project funded by the United States Department of Energy is the first to encounter and address these problems through a system-wide data base structure. DOE

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N82-13979# RAND Corp., Santa Monica, Calif.
A NEW APPROACH TO MODELING THE COST OF OWNERSHIP FOR AIRCRAFT SYSTEMS Interim Report
K. E. Marks, H. G. Massey, B. D. Bradley, and J. Lu Aug. 1981 151 p refs
(Contract F49620-77-C-0023)
(AD-A104434; RAND/R-2601-AF) Avail: NTIS HC A08/MF A01 CSCL 05/1

Support investment costs and recurring operations and support costs are through determined using a model for estimating aircraft cost of ownership (MACO), which also provides a framework for future research. An outgrowth of an earlier evaluation of the strengths and weaknesses of the most widely used aircraft life cycle cost models, MACO combines algorithms for major, maintenance related costs with formulas drawn from existing models for other cost elements. A full set of ownership cost elements is related to component level reliability and maintainability characteristics and to aircraft design, operations, logistics, and deployment parameters. Resource quantities are computed in units that can be related directly to Air Force programming categories, including base maintenance manning (by work center), depot manning, and recoverable spares inventory levels. Output and input parameters accommodate annual changes in system parameters and operating conditions such as component reliability and aircraft inventory size and activity rates. Author

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N82-13980# RAND Corp., Santa Monica, Calif. Dept. of Social Science.
THE EVALUATION OF TECHNOLOGY R&D: A CONTINUING DILEMMA
Peter deLeon Aug. 1981 31 p refs Prepared for UCLA
(RAND/P-6655) Avail: NTIS HC A03/MF A01

The development of new and advanced technologies, especially those with significant potential social effects are discussed. A technology evaluation agenda for the next decade with special emphasis on four issues is proposed: (1) appropriate technology R&D standards and criteria; (2) the institutional context; (3) comparisons to alternative options; and (4) the social effects. E.A.K.

N82-13981*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONTROLLED SPEED ACCESSORY DRIVE DEMONSTRATION PROGRAM
Frank W. Hoehn 15 Oct. 1981 105 p refs
(Contracts NAS7-100; DE-AI01-80CS-50194)
(NASA-CR-165010; JPL-Pub-81-83) Avail: NTIS HC A06/MF A01 CSCL 13F

A Controlled Speed Accessory Drive System was examined in an effort to improve the fuel economy of passenger cars. Concept feasibility and the performance of a typical system during actual road driving conditions were demonstrated. The CSAD system is described as a mechanical device which limits engine accessory speeds, thereby reducing parasitic horsepower losses and improving overall vehicle fuel economy. Fuel consumption data were compiled for fleets of GSA vehicles. Various motor pool locations were selected, each representing different climatic conditions. On the basis of a total accumulated fleet usage of nearly three million miles, an overall fuel economy improvement of 6 percent to 7 percent was demonstrated. Coincident chassis dynamometer tests were accomplished on selected vehicles to establish the effect of different accessory drive systems on exhaust emissions, and to evaluate the magnitude of the mileage benefits which could be derived. J.M.S.

N82-13982# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Materials Lab.
AIR FORCE TECHNICAL OBJECTIVE DOCUMENT FY 1982
Richard L. Verga Jan. 1981 29 p
(AD-A099741; AFWAL-TR-81-4041) Avail: NTIS HC A03/MF A01 CSCL 11/4

The materials technology planning objectives (TPOs) for meeting future Air Force operational needs are described. The six TPOs encompass the full spectrum of materials capabilities required for future aircraft, missile, space, and electronic systems: thermal protection materials; aerospace structural materials; aerospace propulsion materials, fluid, lubricant, and elastomeric materials; protective coatings and materials; and electromagnetic windows and electronics. General objectives, specific goals, technical approaches, and a laboratory focal point are presented. Author

N82-13983# Galaxy, Inc., Washington, D.C.
UPDATE ON SPECIFIED EUROPEAN R AND D EFFORTS. PART 1: APPENDICES
Oct. 1980 117 p Partly in ENGLISH; partly in GERMAN
(Contract DE-AC03-79SF-10538)
(DE81-026404; DOE/SF-10538/T10) Avail: NTIS HC A06/MF A01

Progress and updata on specified European R and D are reported. The following topics are discussed: blueburner test with different swirl spray nozzles, aerodynamics of a flat nonswirl blue flame, and large industrial blue flame burners, manufacturer's design and performance literature for the 2500 to 3500 KW KG5 gas turbine, the Kongsberg 1500 to 2000 kVA generating set, the 500 to 700 kVA generating set, the KG 831 gas turbine generating set, the KG 2 gas turbine, and selection criteria for gas turbines for emergency power supplies; and high temperature corrosion and carburization and silicon coatings as high temperature corrosion protection for gas turbine blades. DOE

N82-13984# Smith (Wilbur) and Associates, New York.
MEASURES OF EFFECTIVENESS OF TRANSPORTATION SYSTEMS MANAGEMENT Final Report
Apr. 1981 43 p refs Prepared jointly with Tri-State Regional Planning Commission
(PB81-233884; UTMA-IT-09-00890-81-1) Avail: NTIS HC A03/MF A01 CSCL 13B

The basic concepts of transportation systems management (TSM) by providing simple classification schemes, geographic conditions of applicability, relative measures of effectiveness, and techniques for quantification were developed. Two key elements

are emphasized: coordination of transportation activities, and maximization of efficiency and productivity. Some of the findings reported are: (1) traffic engineering improvements; (2) demand management measures achieve reductions in vehicle miles of travel; and (3) bus lanes and priority entry treatments. GRA

N82-13985# Aerospace Corp., El Segundo, Calif. Environment and Energy Conservation Div.
EVALUATION OF TECHNIQUES FOR REDUCING IN-USE AUTOMOTIVE FUEL CONSUMPTION Final Report, Jun. 1976 - Mar. 1978
L. Forrest, W. B. Lee, and W. M. Smalley Apr. 1981 330 p refs Prepared in cooperation with Transportation Systems Center
(Contract F04701-77-C-0078)
(PB81-233298; DOT-TSC-NHTSA-81-13; DOT-HS-805833)
Avail: NTIS HC A15/MF A01 CSCL 13F

Techniques for reducing fuel consumption in the light duty road vehicle fleet are assessed. Modification of vehicles, modification of traffic flow, and modification of driver behavior are considered. Factors included in the evaluation are fuel economy effects, safety impacts, availability for fleet implementation, and unit price. In addition, the implementation of each technique is assessed with regard to number of vehicles impacted, fuel savings effected, national cost, potential problems, and required lead time. Cost effective techniques are ranked in terms of their assessed potential for reducing fleet fuel consumption. GRA

N82-13986# Transportation Systems Center, Cambridge, Mass.
HIGHWAY FUEL ECONOMY STUDY Final Report, Sep. 1979 - Mar. 1981
Robert L. Mason and Russell W. Zub Jun. 1981 155 p refs
(PB81-233850; DOT-TSC-NHTSA-81-18; DOT-HS-805873)
Avail: NTIS HC A08/MF A01 CSCL 13F

The fuel consumption changes attributable to speed reduction and compliance with the 55 MPH speed limit are described. The effects of vehicle size and type, and driver-controllable functions on vehicle fuel economy at highway speeds are discussed. Most of the analytical work is related to passenger cars and light trucks, however, medium and heavy trucks, primarily commercial in application, have been included in the highway fuel economy analyses. GRA

N82-13987# Transportation Systems Center, Cambridge, Mass.
WEIGHT REDUCTION POTENTIAL OF AUTOMOBILES AND LIGHT TRUCKS: 1980 SUMMARY SOURCE DOCUMENT Final Report
Hsi-Sheng Hsia Jun. 1981 327 p refs
(PB81-235756; DOT-TSC-NHTSA-81-17; DOT-HS-805892)
Avail: NTIS HC A15/MF A01 CSCL 13F

The potential of weight reduction for passenger cars and light trucks (including pickup trucks, vans, and utility vehicles of GVWR up to 8500 pounds) in the post-1985 period is assessed. Vehicle characteristics and weight reduction methodologies, as well as methodologies for determining secondary weight reduction, are presented. Results of four weight reduction scenarios for material substitution, emphasizing high strength steels, fiberglass reinforced plastics, aluminum, and hybrid reinforced plastics, are presented for baseline vehicles. GRA

N82-13988# National Bureau of Standards, Washington, D.C. National Engineering Lab.
PEDESTRIAN MOVEMENT CHARACTERISTICS ON BUILDING RAMPS Final Report
George Turner and Belinda Collins Jun. 1981 60 p refs
(PB81-229163; NBSIR-81-2310) Avail: NTIS HC A04/MF A01 CSCL 13M

Knowledge of design for effective pedestrian circulation is one of the main requirements in building planning. While an understanding of pedestrian movement characteristics on the various component parts that make up a building circulation system is the key to effective planning, one component type, the ramp, has rarely been the subject of building circulation research. The research described is the result of an investigation of pedestrian movement characteristics on four specific building ramps during two different professional athletic contests. Variables of pedestrian movement such as speed, flow, and density were studied as well as the relationships between them. In addition, counts of pedestrians by sex were made. Results were compared for the specific ramps and with previously reported data obtained for ramps, stairs, and level surfaces. GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N82-13989* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MODERN OBSERVATIONAL TECHNIQUES FOR COMETS
J. C. Brandt, ed. (NASA, Goddard Space Flight Center), J. M. Greenberg, ed. (Leiden Univ.), B. Donn, ed. (NASA, Goddard Space Flight Center), and J. Rahe, ed. (Erlangen-Nuernberg Univ.) 1 Oct. 1981 327 p refs Workshop held at Greenbelt, Md., 22-24 Oct. 1980 Original document contains color illustrations
(Contract NAS7-100)
(NASA-CR-165006; JPL-Pub-81-61) HC SOD $16.00 CSCL 03A

Techniques are discussed in the following areas: astrometry, photometry, infrared observations, radio observations, spectroscopy, imaging of coma and tail, image processing of observation. The determination of the chemical composition and physical structure of comets is highlighted. For individual titles, see N82-13990 through N82-14026.

N82-13990* Toledo Univ., Ohio. Dept. of Physics and Astronomy.
OBSERVING CHEMICAL ABUNDANCES IN COMETS
A. H. Delsemme *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 5-13 refs (For primary document see N82-13989 04-89)
(Grants NsG-7301; NSF AST-79-14789)
HC SOD $16.00 CSCL 03A

The atomic resonance lines of the major elements were observed in the atmospheres of a few comets, by using vacuum ultraviolet spectrographs on board rockets or orbiting observatories. Dust-to-gas ratios were also deduced for two comets through a Finson-Probstein's analysis of their dust-tail isophotes. The geometric albedo of the dust for the phase angle alpha of the observations is not accurately known but, the dust-to-gas ratio is not overly sensitive to the actual value of this albedo. Infrared observations of the dust head of some comets show that the bulk of cometary dust must be silicates, although a minor component (5-10 percent) of carbon compounds is rather likely, because of poor dielectric properties of the grains. This interpretation is confirmed by the fact that interplanetary dust probably of cometary origin, that was collected in the stratosphere by NASA-U2 Spacecraft, is chondritic in nature. Metal abundances in the head of a sungrazing comet support the chondritic hypothesis. T.M.

N82-13991* Los Alamos Scientific Lab., N. Mex.
OBSERVATIONAL DATA NEEDS USEFUL FOR MODELING THE COMA
W. F. Huebner and P. T. Giguere *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 14-18 refs (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

A computer model of comet comae is described; results from assumed composition of frozen gases are summarized and compared to coma observations. Restrictions on relative abundance of some frozen constituents are illustrated. Modeling, when tightly coupled to observational data, can be important for comprehensive analysis of observations, for predicting

undetected molecular species and for improved understanding of coma and nucleus. To accomplish this, total gas production rates and relative elemental abundances of H:C:N:O:S are needed as a function of heliocentric distance of the comet. Also needed are relative column densitites and column density profiles with well defined diaphragm range and pointing position on the coma. Production rates are less desirable since they are model dependent. Total number (or upper limits) of molecules in the coma and analysis of unidentified spectral lines are needed also. T.M.

N82-13992* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

OBSERVATIONAL DATA NEEDS FOR PLASMA PHENOMENA

Malcolm B. Niedner, Jr. *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 21-32 refs (For primary document see N82-13989 04-89)

HC SOD $16.00 CSCL 03A

Bright comets display a rich variety of interesting plasma phenomena which occur over an enormous range of spatial scales, and which require different observational techniques to be studied effectively. Wide-angle photography of high time resolution is probably the best method of studying the phenomenon of largest known scale: the plasma tail disconnection event (DE), which has been attributed to magnetic reconnection at interplanetary sector boundary crossings. These structures usually accelerate as they recede from the head region and observed velocities are typically in the range $50 < V <$ km/s. They are often visible for several days following the time of disconnection, and are sometimes seen out past 0.2 AU from the cometary head. The following areas pertaining to plasma phenomena in the ionoshere are addressed: the existence, size, and heliocentric distance variations of the contact surface, and the observational signatures of magnetic reconnection at sector boundary crossings. T.M.

N82-13993* Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).

ANTICIPATED RESULTS FROM DUST EXPERIMENTS ON COMETARY MISSIONS

J. Kissel, H. Fechtig, and E. Grun *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 33-38 refs (For primary document see N82-13989 04-89)

HC SOD $16.00 CSCL 03A

The major scientific objectives of a mission are: to determine the chemical nature and physical structure of comet nuclei, and to characterize the changes that occur as a function of time orbital position; to characterize the chemical and physical nature of the atmospheres and ionospheres of comets as well as the processes that occur in them, and to characterize the development of the atmospheres and ionospheres as functions of time and orbital position; and to determine the nature of comet tails and processes by which they are formed, and to characterize the interaction of comets with the solar wind. Since dust is a major constituent of a comet, the achievement of these goals requires the intensive study of the paticulate emission from a comet. T.M.

N82-13994* Academy of Sciences (USSR), Dushanbe. Inst. of Astrophysics.

NEW PROBLEMS OF COMETARY OBSERVATIONS FROM SPACE

O. V. Dobrovolsky and S. I. Ibadov *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 39-41 refs (For primary document see N82-13989 04-89)

HC SOD $16.00 CSCL 03A

The possibility of treating the comets as natural probes of the solar system presents one of the attractive sides of cometary astronomy. In connection with the plans to study comets from space, new aspects for comets as interplanetary probes are of interst. Possible meteor formation in cometary heads and the implication for space research are considered. T.M.

N82-13995* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

COMETARY EPHEMERIDES - NEEDS AND CONCERNS

Donald K. Yeomans *In its* Mod. Observational Tech. for Comets 1 Oct. 1981 p 46-49 refs (For primary document see N82-13989 04-89)

(Contract NAS7-100)

HC SOD $16.00 CSCL 03A

With the use of narrow field-of-view instrumentation on faint comets, the accuracy requirements upon computed ephemerides are increasing. It is not uncommon for instruments with a one arc minute field-of-view to be tracking a faint comet that is not visible without a substantial integration time. As with all ephemerides of solar syste objects, the computed motion and reduction of these observations, the computed motion of a comet is further depenent upon effects related to the comet's activity. Thus, the ephemeris of an active comet is corrupted by both observational errors and errors due to the comet's activity. T.M.

N82-13996* Maryland Univ., College Park.

INTRODUCTORY REMARKS: PHOTOMETRY SECTION

Michael F. AHearn *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 53-56 (For primary document see N82-13989 04-89)

HC SOD $16.00 CSCL 03A

The principal goals of photometry and polarimetry are summarized. These goals include studies of the emission features of gaseous species of comets, the wavelength depenence of albedo, the phase function of scatter distribution, and time variation of rotation. Recent advances in photometric techniques were reviewed and include: use of proper filters, extension to the shortest and longest wavelengths, higher spectral resolving power, and polarization techniques. T.M.

N82-13997* Lowell Observatory, Flagstaff, Ariz. Planetary Research Center.

GROUND-BASED PHOTOMETRY OF COMETS IN THE SPECTRAL INTERVAL 3000 TO 3500 ANGSTROM

R. L. Willis (Hawaii Univ.) and M. F. AHearn (Maryland Univ.) *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 57-62 refs (For primary document see N82-13989 04-89)

(Grants NGR-03-003-001; NsG-7322)

HC SOD $16.00 CSCL 03A

Abundances and production rates of CN, C3, and C2 for fifteen comets were determined and the variation of these parameters with helicentric distance for two comets were monitored. While these measurements provide much information about the similarities and differences among comets, only a small fraction of the total material in any of the comets observed was sampled. T.M.

N82-13998* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SPECTROPHOTOMETRY OF FAINT COMETS: THE ASTEROID APPROACH

Johan Degewij *In its* Mod. Observational Tech. for Comets 1 Oct. 1981 p 63-69 refs (For primary document see N82-13989 04-89)

HD SOD $16.00 CSCL 03A

Observing programs at optical (0.35-0.8 micron) and near-infrared (1.1-2.4 micron) wavelengths, directed at the acquisition of reflection spectra of faint and distant comets, are described. The ultimate goal is to obtain spectrophotometric measurements of comets for which a significant part of the light is expected to be reflected by the solid surface of the nucleus. T.M.

N82-13999* Ruhr Univ., Bochum (West Germany). Bereich Extraterrestrische Physik.

RESULTS TO BE EXPECTED FROM LIGHT SCATTERING DUST ANALYZER DURING A RENDEZVOUS MISSION

R. H. Zerull, R. H. Giese, and B. Kneissel IN JPL Mod. Observational Tech. from Comets 1 Oct. 1981 p 72-76 refs (For primary document see N82-13989 04-89)

HC SOD $16.00 CSCL 03A

The light scattering principle for particle detection is customary for the measurement of aerosols. Light scattering techniques can be applied to mixtures of particles (nephelometers) and to single particles as well. Measuring particle mixtures simplify detection because of the higher intensity level, however, information concerning the individual particle is lost. To provide well defined conditions over the whole rendezvous period, i.e., constant illumination beam and unchangeable scattering angle,

the use of an artificial light source (instead of the sun) and a scattering volume located within the S/C is desirable. Considering this and the relatively low particle densities to be expected, the measurement of particle mixtures must be excluded. T.M.

N82-14000* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFRARED OBSERVATIONS OF COMETS
Robert W. Hobbs *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 79-82 refs (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

Infrared observation are important for deducing a great deal about properties of the cometary dust surrounding the cometary nucleus. All observations in the infrared are limited to long period comets. Three features of the spectrum which seem to be present in nearly all of the comets observed are discussed. First, there is a peak in the spectrum in the near infrared and visible wavelength, which can be attributed to scattered sunlight. This feature, as expected, gets fainter as a comet recedes from the sun. The second dominant feature in the spectrum is a broad peak in the infrared which is attributed to the thermal emission of the dust in the coma. This part of the spectrum also gets dimmer as the comet gets further from the sun but, at the same time the peak of the spectrum shifts to longer wavelengths, indicating that the dust from which this radiation arises is cooling as the comets receds. The other feature in the spectrum which is noted is the emission feature at about 10 microns attributed to emission from metallic ilicates. T.M

N82-14001* Arizona Univ., Tucson. Dept. of Planetary Sciences.
INFRARED OBSERVATIONS OF FAINT COMETS
Humberto Campins, Jonathan Gradie, Marcia Lebofsky, and George Rieke *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 83-89 refs (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

Infrared observations of the periodic comets Encke, Stephan-Oterma and Chernykh indicate that the dusty component in this class of comets is not radically different from the dusty component found in nonperiodic comets. The differences in the infrared behavior among these three comets suggest that a range of behaviors rather than a single behavior typifies the cometary activity. The range in albedo (0.02 to 0.10) of the dust calculated for the periodic comets is similar to the range in albedos seen among the asteroids. T.M.

N82-14002* Illinois Univ., Urbana-Champaign. Dept. of Astronomy.
RADIO OBSERVATIONS OF COMETS
L. E. Snyder *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 93-95 refs (For primary document see N82-13989 04-89)
(Grant NSF AST-79-07830)
HC SOD $16.00 CSCL 03A

Three general techniques of radio science used to attempt to observe comets are discussed: spectral line, continum and radar observations. Of these, only radio spectral line observations achieved a degree of success but, more often than not, the results was negative. Cometary excitation and reasons why radio searches can fail were examined. T.M.

N82-14003* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MILLIMETER WAVE RADIOMETRY AS A MEANS OF DETERMINING COMETARY SURFACE AND SUBSURFACE TEMPERATURE
Robert W. Hobbs, John C. Brandt, and Stephan P. Maran *In* JPL Mod. Observations Tech. for Comets 1 Oct. 1981 p 96-103 refs (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

Thermal emission spectra for a variety of cometary nucleus models were evaluated by a radiative transfer technique adapted from modeling of terrestrial ice and snow fields. It appears that millimeter wave sensing from an interplanetary spacecraft is the most effective available means for distinguishing between alternate models of the nucleus and for evaluating the thermal state of the layer which is below the instantaneous surface where modern theories of the nucleus indicate that sublimation of the cometary volatiles actually occurs. T.M.

N82-14004* Toledo Univ., Ohio.
THE SPECTROSCOPY OF COMETS: INTRODUCTORY REMARKS
A. H. Delsemme *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 107-109 refs (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

Emphasis in cometary spectroscopy is on production rates, becuase they open the door to more fundamental clues about the origin and the history of the solar system, through the understanding of comet chemistry. In order to establish production rates quantitatively, suggestion are provided, in particular: to study the lifetimes of all hypothetical parents, against all processes of decay, namely photodissociations, photoionizations and ion-molecule reactions; and to study the velocity of all molecular fragments resulting from all the decay processes, through the balance sheet of the energy distribution before and after each decay process. T.M.

N82-14005* Arizona Univ., Tucson. Lunar and Planetary Lab.
A SYSTEMATIC PROGRAM OF COMETARY SPECTROSCOPY
Stephen M. Larson and Bertram Donn *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 110-114 refs (For primary document see N82-13989 04-89)
(Grant NGL-03-002-002)
HC SOD $16.00 CSCL 03A

Some early results of a systematic program of observing the spectroscopic behavior of comets as a function of heliocentric distance are presented. An ultraviolet sensitive microchannel plate intensifier spectrograph was used to record the 3000-5000A spectrum of comets brighter than magnitude 17 with a spectral resolution of 8 or 16A, followed by direct image for better interpretation of the spatial distribution of spectral features. Although the goals of the program require much more time and data, some interesting results from Comets Schwassmann-Wachmann, 1, Bradfield and Bowell were obtained. T.M.

N82-14006* European Southern Observatory, La Silla (Chile).
OBSERVING FACILITIES AT THE EUROPEAN SOUTHERN OBSERVATORY (ESO) IN CHILE FOR COMETARY OBSERVATIONS
Gerhard F. O. Schnur, Lubos Kohoutek (Hamburger Sternwarte), and Jurgen Rahe (Remeis Sternwarte, Bamberg) *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 115-128 refs (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

The (ESO) is located on the mountain La Silla (geographical coordinates: 4h42m55s10 west, -29 deg 15' 25".8 south, 2400 m elevation. The size of the telescopes ranges from a 40 cm Astrograph to the 3.6 m Richey-Chretien telescope. Future telescopes are discussed: a 2.2 m RC-Telescope which will be identical with the German 2.2 m telescope on Calor Alto in SE-Spain, and a 3.5 m telescope, the New Technology Telescope. In addition to these telescopes, a great number of auxiliary instrumentation are operational. Because ESO has to serve all requests of the visiting astronomers these instruments are designed for very different applications. The telescopes and auxiliary instruments that are especially suited for cometary observations are discussed. The dicussion is divided into three parts: photography, photometry-polarimetry and spectroscopy. T.M.

N82-14007* Arizona State Univ., Tempe. Dept. of Physics.
GROUND-BASED COMETARY SPECTROSCOPY
Susan Wyckoff *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 129-137 refs (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

The observational problems presented by bright comets near perihelion are discussed. High and low resolution spectra (3100-800A) of the bright comets Kohoutek, Kobayashi-Berger-Milon, West and d'Arrest are presented. Digital reduction of

calibrated photographic spectra to relative intensity versus wavelength, can provide useful information. The reduction of comet spectra to absolute intensities involves, however, large uncertainties and should be interpreted cautiously. Data on recent comets lead to the following results: tentative identification of a new ion in the tail of comets, namely, NH(+); spectroscopic resolution of the fragmented nucleus of comet West; and an accurate monochromatic intensity profile of the Co+ emission (4020A) in comet West. T.M.

N82-14008* Maryland Univ., College Park.
CORRELATED GROUND-BASED AND THE OBSERVATIONS
Michael F. AHearn *In* JPL Mod. Observational Tech. for Coments 1 Oct. 1981 p 138-140 refs (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

The value of coordination among different observers particularly, those working in different wavelength regions is highlighted. This coordination is more important among observers of comets than among observers of almost any other class of astronomical object. The basic reason for this is that comets are highly time-variable, often erratically so, and observations of a particular comet usually cannot be repeated. As a result, some uncoordinated observations cannot be interpreted at all while others are susceptible to misinterpretation. Several specific examples of coordinated observations are discussed. T.M.

N82-14009* Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.
ULTRAVIOLET SPECTROSCOPY OF COMETS USING SOUNDING ROCKETS, IUE AND SPACELAB
P. D. Feldman *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 141-147 refs (For primary document see N82-13989 04-89)
(Grants NGR-21-001-001; NsG-5393)
HC SOD $16.00 CSCL 03A

Ultraviolet spectroscopy is a very powerful tool for the study of cometary atmospheres since the four elemental cosmic species, H, C, N and O, as well as several simple molecules made from these species, have their strong resonance transitions in the ultraviolet region of the spectrum. However, due to the opacity of the atmosphere to ultraviolet, these observations must be made from space. Results are presented for observations of several comets along with plans for further cometary spectroscopy. T.M.

N82-14010* Texas Univ. at Austin.
OBSERVATIONS OF FAINT COMETS AT MCDONALD OBSERVATORY: 1978-1980
E. S. Barker, A. L. Cochran, and P. M. Rybski *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 150-155 refs (For primary document see N82-13989 04-89)
(Contracts JPL-699911; JPL-708823; Grant NGR-44-012-052)
HC SOD $16.00 CSCL 03A

Modern observational techniques, developed for spectroscopy and photometry of faint galaxies and quasars, successfully applied to faint comets on the 2.7 m telescope. The periodic comets Van Biesbrock, Ashbrook-Jackson, Schwassmann-Wachmann 1, Tempel 2, Encke, Forbes, Brooks 2, Stephan-Oterma and the new comets Bradfield (19791), Bowell (1980b), Chernis-Petrauskas (1980k) were observed. The comets ranged in magnitude from 10th to 20th magnitude. For comets fainter than 19th magnitude, reflectance spectra at 100A resolution and area photometry were obtained. On comets of 17th or 18th magnitude, spectrometric scans (6A resolution) of the nucleus or inner coma region. On those comets which are brighter than 16th magnitude spatial spectrophotometric (6A resolution) studies of the inner and extended comae were done. An extensive spatial study of the comae of P/Encke and P/Stephen-Oterma, correlated with heliocentric distance is taking place. The observing process used is described and examples of the results obtained to date are discussed. A.R.H.

N82-14011* Washington Univ., St. Louis, Mo. Dept. of Earth and Planetary Sciences.
SPECTRAL IMAGERY: RECENT RESULTS WITH THE SPIFI AND THEIR IMPLICATIONS FOR COMETARY ATMOSPHERIC STUDIES
Wm. Hayden Smith *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 156-160 refs Original document contains color illustrations (For primary document see N82-13989 04-89)
(Grant NsG-7334)
HC SOD $16.00 CSCL 03A

Spectral polarimetric imaging of comets is considered using state-of-the-art methods and a servo-controlled polarimetric imaging Fabry-Perot interferometer is described. Related observational data are shown and sensitivity levels are given which indicate the range of objects which may be studied. Some proposed observational goals are indicated. A.R.H.

N82-14012* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A POSSIBLE TECHNIQUE FOR COMETARY STUDIES WITH HIGH ANGULAR AND SPECTRAL RESOLUTION
T. R. Gull *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 161-166 (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

The echelle spectrographs, designed for and used at the Cassegrain stations of the KPNO and CTIO 4-meter telescopes, are capable of cometary spectroscopy with seeing-limited angular resolution along the slit and with spectral resolving power (lambda/delta lambda) ranging from 10 to the 4th power to 10 to the 5th power. Various gratings, cameras and detectors can be used in combination for specific studies in the 3000A to 10,000A range. A.R.H.

N82-14013* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE JOCR PROGRAM
John C. Brandt *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 171-184 refs (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

Observational data on large-scale plasma structures in comets is of value in (1) analyzing the interaction between the solar wind and comets, (2) using comets as solar wind probes, and (3) using comets as an astrophysical plasma laboratory with the CO+ plasma serving as tracers of the magnetic field. To obtain this data, the Joint Observatory for Cometary Research was built on South Baldy in the Magdalena Mountains west of Socorro, New Mexico, at an altitude of 10,615 feet. The telescope is a 14' f/2 Schmidt camera which records an 80 deg x 10 deg field onto 4 x 5 inch plates. The camera is designed for fixed focus operation, i.e., within design limits, the focus is not a function of temperature. A vacuum platen system allows the use of film for color photography. Sample observations of comets Kohoutek, West, Kobayashi-Berger-Milon and Bradfield are interpreted. A.R.H.

N82-14014* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NARROW PASSBAND IMAGERY OF COMETS
T. R. Gull *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 185-190 refs (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

During an emission-line survey of the Milky Way, Comet West was accidently imaged through four different narrow passbands with a wide-field, image-intensified camera. Three passbands recorded very similar head plus tail structure. The fourth passband shows an additional large, diffuse component around the head. It was serendipitous that such was recorded as the filters, being selected for studies of emission nebulae, are not particularly suited for studies of comets. However the imagery, plus subsequent studies, suggests that much can be learned about the structure of comets using narrow passband imagery simultaneously with long slit spectroscopy. Author

N82-14015* Smithsonian Astrophysical Observatory, Cambridge, Mass.
ON OBSERVING COMETS FOR NUCLEAR ROTATION
Fred L. Whipple *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 191-207 refs (For primary document see N82-13989 04-89)
(Grant NsG-7082)
HC SOD $16.00 CSCL 03A

The prevalent non-gravitational motions among comets demonstrate that the sublimination does not reach a maximum at the instant of maximum insolation on the nucleus. The occurrence of halos or 'parabolic' envelopes in the comae of some comets and of jets, rays, fans, streamers and similar phenomena very near the nucleus in the brightest comets demonstrates that the sublimation process is not uniform over the nuclei. In other words, the nuclei of many comets contain relatively small active regions which provide much or most of the sublimation when these areas are turned toward the Sun. The period of rotation can be determind by measurement of the diameters of the halos or of the latus recta of the 'parabolic' envelopes, if the expansion velocities are averaged from observations as a function of solar distance. Experience from analyses of some 80 well observed comets shows that the nuclei are 'spotted' for more than a third of all comets, regardless of the 'age' as measured by the original inverse semimajor axis including correction for planetary perturbations. A.R.H.

N82-14016* Lowell Observatory, Flagstaff, Ariz.
PHOTOGRAPHIC OBSERVATIONS OF COMETS AT LOWELL OBSERVATORY
Henry L. Giclas *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 202-212 (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

Observations of Halley's comet at Lowell Observatory cover a period from November 10, 1909 to May 17, 1911: 334 direct photographs were taken, 118 objective prism spectra, and 32 slit spectrograms of the nucleus, many of them including 5 arc minutes of the surrounding coma. Just one morning's observations are illustrated as an example of utilizing every possible resource available at the Observatory at the time. Observational improvements developed since then are described and some suggestions for the coming return of Halley's comet are made. A.R.H.

N82-14017* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXISTING COMETARY DATA AND FUTURE NEEDS
Jurgen Rahe *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 213-215 refs (For primary document see N82-13989 04-89)
Avail: NTIS HC SOD $16.00 CSCL 03A

To assist scientists studying comets and their interaction with the interplanetary medium, compilations of existing cometary observations and data plans for additional publication are reported. The works cited include updates and/or supplements to: (1) the Catalogue of Cometary Orbits, (2) Physical Characteristics of Comets, (3) the Atlas of Representative Cometary Spectra, (4) the Atlas Cometas-Viento Solar, (5) the Isophotometrischer Atlas der Kometen, and (6) the Atlas of Cometary Forms. An Atlas of Cometary Spectra and an Atlas of Comet Halley 1910 (II) photographs and spectra are in preparation. A.R.H.

N82-14018* Wien Univ. (Austria). Inst. for Astronomy.
OUTBURST AND NUCLEAR BREAKUP OF COMET HALLEY - 1910
H. John Wood (Indiana Univ., Bloomington) and R. Albrecht *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 216-219 refs Sponsored in part by the AAS (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

Computer processing of five plates of Comet Halley taken during the 1910 apparition shows that on May 24 strong asymmetric (with respect to the tail axis) fountain-like parabolic plumes had developed on the sunward side of the nucleus. Visual observations showed that after an initial fading while passing in front of the sun, the brightness increased to about magnitude 1. On the plates taken May 31, the nucleus is clearly divided into at least three parts of nearly equal brightness. However, the last plate on June 3 shows a symmetrical coma with a small stellar-like nucleus. Author

N82-14019* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE INTERACTIVE ASTRONOMICAL DATA ANALYSIS FACILITY - IMAGE ENHANCEMENT TECHNIQUES TO COMET HALLEY
D. A. Kinglesmith, III *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 223-231 Original document contains color illustrations (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

PDP 11/40 computer is at the heart of a general purpose interactive data analysis facility designed to permit easy access to data in both visual imagery and graphic representations. The major components consist of: the 11/40 CPU and 256 K bytes of 16-bit memory; two TU10 tape drives; 20 million bytes of disk storage; three user terminals; and the COMTAL image processing display system. The application of image enhancement techniques to two sequences of photographs of Comet Halley taken in Egypt in 1910 provides evidence for eruptions from the comet's nucleus. A.R.H.

N82-14020* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ASTRONOMICAL DATA BASES AND RETRIEVAL SYSTEMS
Jaylee M. Mead, Theresa A. Nagy (Systems and Applied Sciences Corp., Riverdale, Md.), and Wayne H. Warren, Jr. *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 232-236 refs (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

The status of the development of machine-readable stellar and extragalactic data bases is summarized, including several examples of astronomical applications using these data sets. The creation of a computerized bibliographical data base for cometary research is described. Author

N82-14021* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NEAR PERIHELION OBSERVATIONS OF COMET HALLEY FROM SHUTTLE ORBITER
Jay T. Bergstralh *In its* Mod. Observational Tech. for Comets 1 Oct. 1981 p 241-248 refs (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

Intercept missions and the space telescope will return unique data on Comet Halley, but will leave important gaps in the observational coverage of the comet's activity, especially around the time of perihelion passage. A small package of instruments, which could be scheduled to fly on several shuttle missions, would be an effective means of extending observational coverage of Comet Halley to include the critical part of the apparition near perihelion passage. This approach would certainly be 'second best' to a dedicated orbital comet observatory. However, it would be feasible in the sense that payload space appears to be available for at least two flights during the apparition, and instruments exist, or could be modified, or are being developed, which could be integrated into a package of the required size, and which would return useful physical data on the comet. A.R.H.

N82-14022* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LABORATORY RESEARCH
B. Donn *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 251-256 refs (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

To properly interpret the rapidly growing body of data from comet observations, many types of laboratory measurements are needed. These include: (1) molecular spectroscopy in the visible, ultraviolet, infrared and microwave region of the spectra; (2) laser fluorescent spectroscopy of photofragments; (3) laboratory cross-section or reaction rate measurements using flow tube techniques, fluorescent spectroscopy detection for neutrals and ion-molecule reaction techniques; (4) experiments to simulate solar-wind interactions with comets; (5) studies of the properties and behavior of ice mixtures; (6) experiments on the sublimation rate of ice, and the phase transition from amorphous to crystalline ice; (7) investigations of the irradiation of ice; and (8) the electron impact dissociation and excitation of molecules of cometary interest. A nearly completed experiment on the proton irradiation of ice is described. A.R.H.

N82-14023* Howard Univ., Washington, D. C.
LABORATORY MEASUREMENTS OF THE COMETARY PHOTOCHEMICAL PHENOMENA
William M. Jackson *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 257-274 refs (For primary document see N82-13989 04-89)
(Contract N00014-80-C-0305; Grant NsG-C-5071)
HC SOD $16.00 CSCL 03A

Laboratory experiments are described that provide fundamental information about photochemical processes in comets. The yield of cometary radicals such as CN, OH, etc. can be determined as a function of photolyzing wavelength. Quantum state distributions of the internal energy of the cometary radicals can also be measured as a function of wavelength permitting one to define the recoil velocity of the fragments. This type of information supplies the data needed for more elaborate models to interpret the data being obtained on comets. Author

N82-14024* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PLANS FOR COMET HALLEY
Jurgen Rahe *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 277-283 refs (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

The configuration, trajectories, and payloads of a spinning Earthorbiting satellite designed by ESA for a post-perihelion flythrough (Giotto mission) of Comet Halley are described. Experiments approved for use on two identical three-axis stabilized Venera spacecraft destined to encounter the comet after releasing probes to Venus are listed as well as the instruments to be carried on Japan's Planet-A flyby mission. The main features launch windows are given for each spacecraft. A.R.H.

N82-14025* European Space Agency, Noordwikj (Netherlands).
THE ESA MISSION TO COMET HALLEY
R. Reinhard *In* JPL Mod. Observational Tech. for Comets 1 Oct. 1981 p 284-312 refs (For primary document see N82-13989 04-89)
HC SOD $16.00 CSCL 03A

The Europeon Space Agency's approximately Giotto mission plans for a launch in July 1985 with a Halley encounter in mid-March 1986 4 weeks after the comet's perihelion passage. Giotto carries 10 scientific experiments, a camera, neutral, ion and dust mass spectrometers, a dust impact detector system, various plasma analyzers, a magnetometer and an optical probe. The instruments are described, the principles on which they are based are described, and the experiment key performance data are summarized. The launch constraints the helicentric transfer trajectory, and the encounter scenario are analyzed. The Giotto spacecraft major design criteria, spacecraft subsystem and the ground system are described. The problem of hypervelocity dust particle impacts in the innermost part of the coma, the problem of spacecraft survival, and the adverse effects of impact-generated plasma around the spacecraft are considered. A.R.H.

N82-14026* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE INTERNATIONAL HALLEY WATCH: A PROGRAM OF COORDINATION, COOPERATION AND ADVOCACY
L. Friedman and R. L. Newburn *In its* Mod. Observational Tech. of Comets 1 Oct. 1981 p 313-314 (For primary document see N82-13989 04-89)
(Contract NAS7-100)
HC SOD $16.00 CSCL 03A

To prevent a repetition of the lack of reporting and dissemination of the data obtained during the 1910 observations of Comet Halley, a mechanism is proposed for coordinating the work of scientists and amateurs, including government, industrials, and academic personnel during the 1985-86 apparition of Comet Halley. Specialists from each discipline, in consultation with other experts in the field, would recommend specific objectives, standards, data format, and priorities for observations in that discipline. Following time for individual publication, scientists would be invited to contribute results to a multivolume compilation containing as complete as possible a record of the apparition. It is suggested that the discipline specialists be selected jointly by the IHW leader an by an international steering group with members from COSPAR, the IAU, etc., perhaps in response to some form of international announcement of opportunity. A.R.H.

N82-14027*# California Univ., Los Angeles. Dept. of Astronomy.
EVOLUTION OF CLOSE BINARY SYSTEMS: OBSERVATIONAL ASPECTS
Mirek J. Plavec Nov. 1981 22 p refs Presented at the IAU Colloq. No. 69, Binary and Multiple Stars as Tracers of Stellar Evolution, Bamberg, West Germany, Sep. 1981 Sponsored by NASA and NSF
(NASA-CR-165039; Rept-134) Avail: NTIS HC A02/MF A01 CSCL 03A

Detached close binary systems define the main sequence band satisfactorily, but very little is known about the masses of giants and supergiants. High dispersion international ultraviolet explorer satellite observations promise an improvement, since blue companions are now frequently found to late type supergiants. Mu Sagittaril and in particular Xi Aurigae are discussed in more detail. The barium star abundance anomaly appears to be due to mass transfer in interacting systems. The symbiotic stars are another type of binary systems containing late type giants; several possible models for the hotter star and for the type of interaction are discussed. The W Serpentis stars appear to be Algols in the rapid phase of mass transfer, but a possible link relating them to the symbiotics is also indicated. Evidence of hot circumstellar plasmas has now been found in several ordinary Algols; there may exist a smooth transition between very quiescent Algols and the W Serpentis stars. Beta Lyrae is discussed in the light of new spectrophotometric results. Author

N82-14028# European Southern Observatory, Munich (West Germany).
[ASTRONOMICAL ACTIVITIES REPORT] Annual Report, 1980
L. Woltjer 1980 62 p refs
(ISSN-0531-4496) Avail: NTIS HC A04/MF A01

Research, using the Schmidt telescope and the sky survey and atlas laboratories, is outlined together with joint research with the Chilean institute. Telescopes, instrumentation, and image processing facilities are reviewed, including studies on the design of a computer controlled mirror support system for a very large (3.5m) telescope, and the testing and installation of the Coude Echelle Spectrometer. Tables show the programs and institutes using the 3.6m, 1.52m, and 1m telescopes, and the Danish 1.54m and Dutch 92cm telescopes. Author (ESA)

N82-14029 Stanford Univ., Calif.
X-RAY AND ULTRAVIOLET OBSERVATIONS OF STELLAR ATMOSPHERES Ph.D. Thesis
Marie-Christine Sophie Zolcinski 1981 137 p
Avail: Univ. Microfilms Order No. 8124181

Implications of atmospheric models for the observation of stellar atmospheres are discussed. Seven of the most luminous X-ray stars were observed with the IUE observatory. Flux determinations for emission lines originating from chromospheric and transition region like temperatures for four stars and upper limits for the three other stars were obtained. Combined with the Einstein observations, this allowed calculation of a differential emission measure for each star, and to constraint atmospheric parameters such as the pressure at the top of the chromosphere, the isothermal temperature of the corona and the fraction of stellar surface covered by emitting loops. Dissert. Abstr.

N82-14030 Florida Univ., Gainesville.
OPTICAL BRIGHTNESS VARIATIONS IN A SAMPLE OF NINETEEN RADIO-QUIET QUASI-STELLAR OBJECTS Ph.D. Thesis
Patricia Louise Edwards 1981 174 p
Avail: Univ. Microfilms Order No. 8124423

Monitoring of the optical brightnesses was done to study the characteristics of the variability of the RQQSOs for comparison with the much larger sample of quasi-stellar radio sources (QSRSs). A variability index (V.I.) was computed to facilitate numerical comparisons and to check for correlation between the extent of variability and other properties of the quasistellar objects (QSOs). Of the nineteen RQQSOs studied, eight did not show evidence of variability at the confidence level of at least 95

percent. Eight objects (PHL 3632, PHL 1186, PHL 1226, BSO 1, B 154, B 234, B 312, and BSO 11) were variable at a confidence level greater than 95 percent. An additional three objects showed variability at a confidence level greater than 99.9 percent. These strongly varying objects were PHL 1194, B 46, and B 114. The proportion of RQQSOs which show variability is similar to that of the QSRs. Dissert. Abstr.

N82-14031 Ohio State Univ., Columbus.
THE TRANSFER OF POLARIZED RADIATION IN SPECTRAL LINES FROM ROTATIONALLY DISTORTED STARS Ph.D. Thesis
Sean Jeffrey McKenna 1981 182 p
Avail: Univ. Microfilms Order No. 8121830

The development of an accurate NLTE theory for the transport of polarized radiation in spectral lines with the inclusion of partial frequency redistribution of photons in the scattering process was investigated. The nature of the scattering process and the forms of the redistribution functions for model two level atoms are discussed. A NLTE theory for the transport of polarized radiation in spectral lines is derived, and is tested for lines formed in isothermal atmospheres. The theoretical line profiles and polarization structures for lines are computed for solar atmospheric conditions. There is a clear separation of the polarization maxima as the inclination of the system is varied. Using data from other spectral lines, it may be possible to determine the inclination of the rotational axis of the rapidly rotating stars, and ultimately the geometry of the emitting region. Dissert. Abstr.

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N82-14032# Los Alamos Scientific Lab., N. Mex.
RADIATION-HYDRODYNAMICS OF HII REGIONS AND MOLECULAR CLOUDS
M. T. Sandford, II, Rodney W. Whitaker, and Richard I. Klein 1981 7 p refs Presented at the IAU Colloq., Penticton, Canada, 24-26 Jun. 1981
(Contract W-7405-eng-36)
(DE81-028696; LA-UR-81-2320; CONF-8106140-1) Avail: NTIS HC A02/MF A01

Two-dimensional calculations of ionization-shock fronts surrounding neutral cloud clumps reveal that a radiation-driven implosion of the clump can occur. The implosion of a cloud clump results in the formation of density enhancements that may eventually form low mass stars. The smaller globules produced may become Herbig-Haro objects, or maser sources. DOE

N82-14033 Ohio State Univ., Columbus.
AN INVESTIGATION OF WARM CARBON STARS Ph.D. Thesis
Sandra Bruce Yorka 1981 191 p
Avail: Univ. Microfilms Order No. 8121876

Warm carbon stars were investigated with narrow band photometric systems designed to measure band strengths of NH, CN, CH, and C2, an index of the C12/C13 ratio, and the color temperature. It is shown from molecular indices for R, CH, CH like, and barium stars as compared to G and K giants that the barium stars have slightly higher C/O ratios than normal field giants and, though they are N-enriched with respect to the sun, they generally are not as N enriched as the field giants. A comparison of the photometry with model atmospheres shows the energy distribution of the R stars in the near IR, but are underblanketed in the UV. It is found that the R stars have nitrogen abundances somewhat lower than those of the giants. Dissert. Abstr.

N82-14034 California Univ., Los Angeles.
RADIATIVELY COOLED STELLAR WINDS Ph.D. Thesis
Pornchai Pacharintanakul 1981 173 p
Avail: Univ. Microfilms Order No. 8122831

An approach to solving time dependent hydrodynamics in spherical gemoetry was developed and used to solve the evolutionary models for mass loss rates above the limit. It is found that the flow stops, due to excessive cooling, within the flow time scale. After that the one dimensional spherical symmetry model might be invalid because of the thermal instability and the development of shocks and/or turbulence and a three dimensional model is needed. Results of both steady state and evolutionary calculations of hydrodynamics in spherical geometry are discussed. Dissert. Abstr.

N82-14035 Yale Univ., New Haven, Conn.
INTERMEDIATE BAND SURFACE PHOTOMETRY OF ELLIPTICAL GALAXIES Ph.D. Thesis
Robert James Boyle 1981 239 p
Avail: Univ. Microfilms Order No. 8124348

Detailed surface photometry of two normal elliptical galaxies, NGO 3379 and NGC 4406 was developed. The present structure of elliptical galaxies contains clues to the physical processes which played an important role in their early evolution. The photometric system provides six indicies measuring a variety of absorption and continuum features. The color profiles of these galaxies reveal two distinct classes of color and band strength gradients. A number of population syntheses were carried out using the color profiles derived for NGC 3379. The existence of an inflection point in the luminosity profile of the archetypal elliptical NGC 3379, is confirmed. The excess luminosity or bulge in the luminosity profile which gives rise to this inflection point can be adequately represented by a very broad gaussian. Dissert. Abstr.

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N82-14036 Washington Univ., St. Louis, Mo.
POTASSIUM-ARGON AND IODINE-XENON GAS RETENTION AGES OF ENSTATITE CHONDRITE METEORITES Ph.D. Thesis
Burton Mack Kennedy 1981 311 p
Avail: Univ. Microfilms Order No. 8122742

Chondritic meteorites are generally considered to represent the most chemically primitive solar system material presently available for analysis. Due to their primitive nature, they preserve a record of the early solar system history and provide a substantial contribution to the knowledge of the events which characterized the early history of the solar system. The enstatite chondrites are a very unusual and rare group of meteorites characterized by a high degree of reduction. Radiometric ages of meteoritic material accordingly provide important data for the evaluation of early solar system history by establishing a time scale over which various discrete and/or episodic events have occurred. The potassium-argon an iodine zenon radiometric dating techniques were applied to a suite of enstatite chondrite meteorites. Dissert. Abstr.

N82-14037*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PLANETARY RADIO ASTRONOMY OBSERVATIONS FROM VOYAGER-2 NEAR SATURN
J. W. Warwick, D. R. Evans, J. H. Romig, J. K. Alexander, M. D. Desch, M. L. Kaiser, M. Aubier, Y. Leblanc, A. Lecacheux, and B. M. Pedersen Nov. 1981 22 p refs Submitted for publication Prepared in cooperation with Radiophysics, Inc., Boulder, Colo. and Observatoire de Paris, Meudon, France
(Contract NAS7-100)
(NASA-TM-83856) Avail: NTIS HC A02/MF A01 CSCL 03B

Voyager-2 planetary radio astronomy measurements obtained near Saturn are discussed. They indicate that Saturnian kilometric radiation is emitted by a strong, dayside source at auroral latitudes in the Northern Hemisphere and by a weaker (by more than an order of magnitude) source at complementary latitudes in the

Southern Hemisphere These emissions are variable both due to Saturn's rotation and, on longer time scales, probably due to influences of the solar wind and the satellite Dione. The Saturn electrostatic discharge bursts first discovered by Voyager-1 and attributed to emissions from the B-ring were again observed with the same broadband spectral properties and a 10(h)11(m) + or - 5(m) episodic recurrence period but with an occurrence frequency of only of about 30 percent of that detected with Voyager-1. During the crossing of the ring plane at a distance of 2.88 R sub S, an intense noise event is interpreted to be consequence of the impact/vaporization/ionization of charged micron-size G-ring particles distributed over a total vertical thickness of about 1500 km. B.W.

N82-14038*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATURNIAN KILOMETRIC RADIATION: SOURCE LOCATIONS
M. L. Kaiser and M. D. Desch Nov. 1981 20 p refs Submitted for publication
(NASA-TM-83846) Avail: NTIS HC A02/MF A01 CSCL 03B

The surce locations of both polariation components of the Saturn kilometer wavelength radiation were deduced using Voyager 1 and Voyager 2 planetary radio astronomy data and assumptions about radiation beam geometry. Radio source footprints were compared with the surface locations of Saturns ultraviolet aurorae, its polar cap boundary, and its polar cusp. R.J.F.

N82-14039*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
ASTROMETRIC OBSERVATIONS OF COMETS AND ASTEROIDS AND SUBSEQUENT ORBITAL INVESTIGATIONS Semiannual Progress Report, 1 May - 31 Oct. 1981
Richard E. McCrosky and Brian G. Marsden Nov. 1981 14 p refs
(Grant NGR-09-015-212)
(NASA-CR-165004; SAPR-16) Avail: NTIS HC A02/MF A01 CSCL 03B

Comets and minor planets were observed with a 155 cm reflector. Their orbital positions are presented in tabular form. S.L.

N82-14040*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CATALOG OF LUNAR MARE BASALTS GREATER THAN 40 GRAMS. PART 1: MAJOR AND TRACE CHEMISTRY, WITH MEGASCOPIC DESCRIPTIONS AND ROCK AND THIN SECTION PHOTOGRAPHS
Gary E. Lofgren and Ellen M. Lofgren (Lunar and Planetary Inst.) Aug. 1981 420 p refs
(NASA-TM-84065; LPI-Contrib-438) Avail: NTIS HC A18/MF A01 CSCL 03B

Megascopic descriptions of 133 basaltic rocks returned from the Moon are presented along with photographs of each rock and its thin section, if available. The major and trace element chemistry of each is included wherever possible. A.R.H.

N82-14041*# National Aeronautics and Space Administration, Washington, D. C.
REPORTS OF PLANETARY GEOLOGY PROGRAM, 1981
Henry E. Holt, comp. Dec. 1981 580 p refs
(NASA-TM-84211) Avail: NTIS HC A25/MF A01 CSCL 03B

Abstracts of 205 reports from Principal investigators of NASA's Planetary Geology Program succinctly summarize work conducted and reflect the significant accomplishments. The entries are arranged under the following topics: (1) Saturnian satellites; (2) asteroids, comets and Galilean satellites; (3) cratering processes and landform development; (4) volcanic processes and landforms; (5) Aerolian processes and landforms; (6) fluvial, preglacial, and other processes of landform development; (7) Mars polar deposits, volatiles, and climate; (8) structure, tectonics, and stratigraphy; (9) remote sensing and regolith chemistry; (10) cartography and geologic mapping; and (11) special programs. A.R.H.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N82-14042# Nagoya Univ., Toyokawa (Japan).
A TRIGGERING OF SOLAR FLARE BY MAGNETOSONIC WAVES IN A NEUTRAL SHEET PLASMA
Jun-Ichi Sakai and Haruichi Washimi Sep. 1981 31 p refs (IPPJ-540) Avail: NTIS HC A03/MF A01

A theoretical model of the triggering of a solar flare by magnetosonic waves in a neutral sheet plasma is discussed. It is shown that the ponderomotive force due to the magnetosonic waves strongly excites the plasma convection flow in the magnetic neutral sheet which in turn enhances the tearing instability. The system of basic equations for the tearing mode including the time-averaged nonlinear effects due to the magnetosonic waves is derived and the boundary value problem is solved. The results show that the growth time of the instability is shortened to about 100 sec for reasonable magnetosonic wave intensity. Author

N82-14043*# Hawaii Univ., Honolulu. Inst. for Astronomy.
SUBMILLIMETER OBSERVATIONS OF SOLAR LIMB-BRIGHTENING IN THE TOTAL SOLAR ECLIPSE OF 31 JULY 1981 Final Technical Report, 1 Oct. 1980 - 30 Sep. 1981
Eric E. Becklin, John T. Jefferies, Charles Lindsey, Frank Orrall, Ian Gatley, and Michael Werner 30 Sep. 1981 3 p
(NASA-CR-165023; Grant NAG2-59)
Avail: NTIS HC A02/MF A01 CSCL 03B

Eight flights of the Kuiper Airborne Observatory (KAO) were devoted to solar observation. The successful observation of a total solar eclipse was accomplished. The observations were made simultaneously at 30, 50, 100, and 200 microns. The successful adaptation of the KAO for solar observations thus provided the most detailed data to date in this spectral band. The results from a preliminary analysis of the KAO data are summarized: (1) the 200 micron limb is extended about 3 arc sec above the 30 micron limb, indicating the prescence of cool dense material up to the altitudes of spicules; (2) strong radial darkening of the quiet sun intensity profile appeared at 200 microns, probably an indication that hot material in the low chromosphere is recessed into vertical magnetic flux tubes embedded in a cooler nonmagnetic substrate, which obscures the heated material approaching the limb; (3) active regions were observed to undergo a strong increase in contrast above the quiet sun background at wave lengths of 100 microns and longer; and (4) the moon was mapped for use as a photometric standard for determining the absolute intensity of the sun in all four wavelength bands. N.W.

N82-14044# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Data and Information Service.
SOLAR-GEOPHYSICAL DATA. PROMPT REPORT, PART 1
Helen E. Coffey Mar. 1981 184 p
(PB81-221178; NOAA-81050602-Pt-1; SGD-439-Pt-1) Avail: NTIS HC A09/MF A01 CSCL 03B

In addition to an index for 1980-1981, this prompt report provides data for February 1981 on: alert periods, daily solar indices, solar flares, solar radio emission, inferred interplanetary magnetic field polarities, mean solar magnetic field, coronal holes and the Boulder geomagnetic substorm log. It also provides data for January 1981 on: daily solar activity centers, sudden ionospheric disturbances, spacecraft observations, solar radio emission, cosmic rays, geomagnetic indices and radio propagation indices. Late data includes solar radio emission for January 1981, cosmic rays Huancayo November, December 1980, geomagnetic indices for December 1980, and errata for December 1980 regions of solar activity. GRA

N82-14045# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Data and Information Service.
SOLAR-GEOPHYSICAL DATA. COMPREHENSIVE REPORTS, PART 2
Helen E. Coffey, ed. Mar. 1981 131 p
(PB81-221186; NOAA-81050603-Pt-2; SGD-439-Pt-2) Avail: NTIS HC A07/MF A01 CSCL 03B

In addition to an index for 1980-1981, this issue of comprehensive reports provides data for September 1980 on: solar radio emission, solar X-ray radiation, and mass ejections from the sun. The daily flare index and the regional flare index appear 13 and 14 months from the date of observation. This report includes solar flares for September 1979 and for October 1979. Miscellaneous data includes: active regions July 5-August 29, 1980, synoptic solar maps July 5 - August 29, 1980, and the regional flare index for August 1979. GRA

N82-14046# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Data and Information Service.
SOLAR-GEOPHYSICAL DATA. EXPLANATION OF DATA REPORTS
Feb. 1981 94 p
(PB81-221194; NOAA-81050601-Suppl; SGD-438-Suppl.)
Avail: NTIS HC A05/MF A01 CSCL 03B

A complete index for data since July 1957 is presented. Data in the monthly publication, Solar-Geophysical Data are described and explained in an effort to keep research workers informed on a timely schedule of the major events of solar activity and the associated interplanetary, ionospheric, radio propagation and other geophysical effects. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

No abstracts in this category.

99 GENERAL

N82-14047*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
REPORT ON RESEARCH AND TECHNOLOGY-FY 1981
Annual Report
Nov. 1981 39 p
(NASA-TM-81367) Avail: NTIS HC A03/MF A01 CSCL 05A

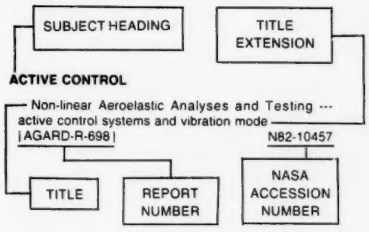
More than 65 technical reports, papers, and articles published by personnel and contractors at the Dryden Flight Research Center are listed. Activities performed for the Offices of Aeronautics and Space Technology, Space and Terrestrial Applications, Space Transportation Systems, and Space Tracking and Data Systems are summarized. Preliminary stability and control derivatives were determined for the shuttle orbiter at hypersonic speeds from the data obtained at reentry. The shuttle tile tests, spin research vehicle nose shapes flight investigations, envelope expansion flights for the Ames tilt rotor research aircraft, and the AD-1 oblique wing programs were completed as well as the KC-135 winglet program. A.R.H.

N82-14048# California Univ., Livermore. Lawrence Livermore Lab.
LLNL 1981: TECHNICAL HORIZONS
Jul. 1981 49 p
(Contract W-7405-eng-48)
(DE81-028265; UCRL-52000-81-7) Avail: NTIS HC A03/MF A01

Research programs are described in broad terms. A $481 million operating budget is projected for fiscal year 1982, up nearly 13% from last year. In projects for the Department of Energy and the Department of Defense, the Laboratory applies its technical facilities and capabilities to nuclear weapons design and development and other areas of defense research that include inertial confinement fusion, nonnuclear ordnances, and particle-beam technology. LLNL is also applying its unique experience and capabilities to a variety of projects that will help the nation meet its energy needs in an environmentally acceptable manner. DOE

SUBJECT INDEX

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7050).

A

ABERRATION
Phase measurments in the focal region of an aberrated lens N82-13875
ABILITIES
Forecasting skill --- weather forecasting
[AD-A099778] N82-13626
ABLATIVE MATERIALS
Controlled overspray spray nozzle
[NASA-CASE-MFS-25139-1] N82-13376
ABRIKOSOV THEORY
Upper critical fields and span states in A-15 superconductors, part 1. Vortices in two-dimensional superconductors, part 2 N82-13942
ABSORBERS (EQUIPMENT)
Raven aircraft filter-absorber --- agricultural aircraft
[AD-A098962] N82-13139
ABSORPTION SPECTRA
Infrared vibrational predissociation spectroscopy of small molecular clusters
[DE81-028648] N82-13887
Intermediate band surface photometry of elliptical galaxies N82-14035
ABSORPTIVITY
Atomic pair processes and laser applications N82-13417
Critically evaluated data on optical and transport properties of solids (refractive index and absorption coefficient of selected optical materials)
[AD-A105059] N82-13879
ABUNDANCE
Observing chemical abundances in comets N82-13990
Ground-based photometry of comets in the spectral interval 3000 to 3500 angstrom N82-13997
ACCELERATED LIFE TESTS
An improved stress corrosion test medium for aluminum alloys
[NASA-TM-82452] N82-13216
Elevated temperature fatigue testing of metals N82-13281
Statistical analysis of accelerated temperature aging of semiconductor devices
[AD-A099439] N82-13946
ACCELERATION STRESSES (PHYSIOLOGY)
Influence of sine, and random, whole-body vibration on visual acuity
[BMVG-FBWT-79-17] N82-13653
A study on task difficulty and acceleration stress N82-13668
ACCESS CONTROL
Information storage in a decentralized computer system N82-13732
ACCESSORIES
Controlled Speed Accessory Drive demonstration program
[NASA-CR-165010] N82-13981
ACCIDENT PREVENTION
Control of methane by ventilation of shafts during raise drilling
[PB81-234502] N82-13487
Creating a safer environment in US coal mines: The Bureau of Mines Methane Control Program, 1964-79
[PB81-233918] N82-13488
ACCURACY
A comparison of three programs for the calculation of surface-ratio
[FOA-C-20392-D8] N82-13779
ACETYLENE
Metal ion modification of polymeric sulfur nitride, (SN) subx, electrodes and electrochemical reduction of acetylene at a molybdenum modified (SN)sub x electrode N82-13185
ACOUSTIC ATTENUATION
Laboratory study of sound propagation into a fast bottom medium
[AD-A104596] N82-13831
Ultrasonic attenuation and velocity studies in the alpha-alpha' solid solution phases of the Nb-H system
[DE81-026618] N82-13836
ACOUSTIC EMISSION
Investigation of the acoustic emission and deformation response of finite ice plates
[AD-A103731] N82-13471
ACOUSTIC IMPEDANCE
The relationship between the acoustic impedance and unsteady flow field near the orifice of a two dimensional Helmholtz resonator in grazing flow N82-13378
ACOUSTIC MEASUREMENTS
Acoustical speckle interferometry and applications in experimental mechanics N82-13826
Propagation of sound through the Earth's atmosphere
[NASA-CR-165008] N82-13828
ACOUSTIC PROPERTIES
Acoustic nondestructive evaluation of microstructure --- pure copper and plain carbon and low alloy steels N82-13211
ACOUSTIC SCATTERING
Acoustic boundary wave generation and shadowing at a seamount
[AD-A104594] N82-13832
Theoretical analysis of the effects of turbulence on a mobile parametric receiver
[AD-A101418] N82-13833
ACOUSTO-OPTICS
Linear acousto-optic filtering with heterodyne and frequency-plane control N82-13352
ACRYLIC RESINS
Large amplitude compression and shear wave propagation in impact-loaded PMMA
[AD-A105953] N82-13450
ACTINIDE SERIES
Electrochemical and spectroscopic studies of some less stable oxidation states of selected lanthanide and actinide elements N82-13182
ACTIVATION (BIOLOGY)
Benefits of detailed models of muscle activation and mechanics N82-13713
ACTIVATION ENERGY
Experimental and theoretical studies of excited state transport N82-13967
ACTIVE CONTROL
An analytical and experimental study of the steady and unsteady airloads on a wing with oscillating control including a streamlined gap --- wind tunnel test
[DFVLR-FB-81-18] N82-13119
Maneuver load control for the reduction of design loads and improvement of the maneuverability of modern fighter aircraft
[BMVG-FBWT-81-2] N82-13138
Design for active and passive flutter suppression and gust alleviation
[NASA-CR-3482] N82-13147
Interactive aircraft flight control and aeroelastic stabilization --- forward swept wing flight vehicles
[NASA-CR-165036] N82-13150
ADAPTIVE FILTERS
Superconducting magnetometry for cardiovascular studies and an application of adaptive filtering N82-13648
Adaptive equalization algorithms for a dispersive channel
[ENST-E-80012] N82-13776
ADDITIVES
The effects of added softening agents upon the behavior of cold recycled asphalt mixtures
[PB81-231417] N82-13268
ADHESION TESTS
Test number 2 of propellants for rocket motor E573
[FOA-C-20411-D1] N82-13254
ADSORPTION
Surface characterization of dispersed supported metal catalysts using a 'time lapse' dynamic pulse technique N82-13177
Salt removal from brackish water by continuous processes with amphoteric, thermally regenerable ion-exchange resins N82-13202
Physical adsorption of quantum atomic and molecular systems N82-13846
Coexistence of non-registered monolayer and bilayer solid films N82-13931
AERIAL EXPLOSIONS
Electronic measurement of airblast overpressure
[AD-A105379] N82-13389
AERIAL RECONNAISSANCE
Aircraft data summaries for the SURE intensives, volume 1
[DE82-900314] N82-13568
Aircraft data summaries of the SURE intensives, volume 5
[DE82-900310] N82-13570
AERODYNAMIC BALANCE
Evaluation of an experimental technique to investigate the effects of the engine position on engine/pylon/wing interference N82-13090
AERODYNAMIC CHARACTERISTICS
Aerodynamics of Power Plant Installation
[AGARD-CP-301] N82-13065

Top-mounted inlet system feasibility for transonic-subsonic fighter aircraft applications N82-13067

Some RAE research on shielded and unshielded fuselage mounted air intakes at subsonic and supersonic speeds N82-13068

Subsonic military aircraft engine intake: An integrated theoretical experiment design N82-13073

The design and development of the Tornado engine air intake N82-13074

Integration of advanced exhaust nozzles N82-13075

Prop-fan integration at cruise speeds N82-13097

Force and moment, flow-visualization, and boundary-layer tests on a shuttle orbiter model at Mach 6
[NASA-TP-1952] N82-13106

An aerodynamic design and the overall stage performance of an air-cooled axial-flow turbine
[NAL-TR-321T] N82-13109

The effect of rotor blade thickness and surface finish on the performance of a small axial flow turbine
[NASA-TM-82726] N82-13114

Aerodynamics of an airfoil with a jet issuing from its surface N82-13121

AERODYNAMIC COEFFICIENTS

Experimental determination of the effect of physical properties on the drag of liquid drops N82-13380

AERODYNAMIC CONFIGURATIONS

Consolidation of data base for Army generalized missile model
[NASA-CR-166273] N82-13046

AERODYNAMIC DRAG

A review of the effect of Reynolds number on afterbody drag N82-13080

Wind tunnel test and analysis techniques using powered simulators for civil nacelle installation drag assessment N82-13088

Establishment of an experimental technique to provide accurate measurement of the installed drag of close coupled civil nacelle/airframe configurations, using a full span model with turbine powered engine simulators N82-13089

Prop-fan integration at cruise speeds N82-13097

Refinement of a method for determining the induced and profile drag of a finite wing from detailed wake measurements N82-13103

Experimental determination of the effect of physical properties on the drag of liquid drops N82-13380

AERODYNAMIC FORCES

Force measurements on a reflex cambered delta wing
[LOG-C4073] N82-13111

AERODYNAMIC HEAT TRANSFER

Influence of wall roughness, adverse pressure gradient and heat transfer on wall shear stress measurements with Preston tubes
[ILR-50] N82-13396

AERODYNAMIC HEATING

Aerodynamic heating on the corrugated surface of a 10.2 deg half-angle blunted cone at Mach 6.7
[NASA-TP-1928] N82-13383

AERODYNAMIC INTERFERENCE

Airframe-propulsion system aerodynamic interference predictions at high transonic Mach numbers including off-design engine airflow effects N82-13098

An analytical and experimental study of the steady and unsteady airloads on a wing with oscillating control including a streamlined gap --- wind tunnel test
[DFVLR-FB-81-18] N82-13119

AERODYNAMIC LOADS

Contributions to the aerodynamics of wing-body configurations in the nonlinear range of angles of attack
[BMVG-FBWT-80-11] N82-13117

Maneuver load control for the reduction of design loads and improvement of the maneuverability of modern fighter aircraft
[BMVG-FBWT-81-2] N82-13138

Prediction of aerodynamic loads on aircrafts with external stores at transonic speeds N82-13813

AERODYNAMIC STABILITY

Wind-tunnel investigation of the tail-spoiler concept for stall-prevention on general aviation airplanes
[NASA-TM-83208] N82-13047

System identification helicopter parameters. Determination from flight tests, phase 2
[BMVG-FBWT-80-12] N82-13137

AERODYNAMIC STALLING

Wind-tunnel investigation of the tail-spoiler concept for stall-prevention on general aviation airplanes
[NASA-TM-83208] N82-13047

Compressor stall inducing installation effects of an engine control parameter for the CF-5 aircraft N82-13085

AERODYNAMICS

Aeronautical engineering: A continuing bibliography with indexes, supplement 140 --- October 1981
[NASA-SP-7037(140)] N82-13044

Prediction of subsonic aircraft flows with jet exhaust interactions N82-13096

Soviet UCG experience specifically related to field experiments in the United States
[DE81-028642] N82-13244

Technical evaluation report on the Fluid Dynamics Panel Symposium on Computation of Viscous-Inviscid Interactions
[AGARD-AR-171] N82-13384

Report on research and technol. ty-FY 1981
[NASA-TM-81367] N82-14047

AEROELASTICITY

Unsteady aeroelastic modeling and trailing-edge flap control of an experimental wing in a two dimensional wind tunnel N82-13122

Design for active and passive flutter suppression and gust alleviation
[NASA-CR-3482] N82-13147

Interactive aircraft flight control and aeroelastic stabilization --- forward swept wing flight vehicles
[NASA-CR-165036] N82-13150

AERONAUTICAL ENGINEERING

Aeronautical engineering: A continuing bibliography with indexes, supplement 140 --- October 1981
[NASA-SP-7037(140)] N82-13044

NASA research in aircraft propulsion
[NASA-TM-82771] N82-13146

Compilation of abstracts of dissertations theses, and research papers submitted by candidates for degrees, 1 October 1979 - 30 September 1980
[AD-A104124] N82-13974

AERONAUTICS

A summary of the Naval Postgraduate School Research Program
[AD-A104112] N82-13975

AEROSOLS

Raven aircraft filter-absorber --- agricultural aircraft
[AD-A098962] N82-13139

Studies of sample introduction for inductively coupled plasma emission spectrometry N82-13209

Environmental effects of pollutants from coal combustion. 2: The Colstrip, Montana Power Plant
[PB81-234114] N82-13573

SAM 2 measurements of the polar stratospheric aerosol, volume 1: October to April 1979
[NASA-RP-1081] N82-13592

Hawaii Mesoscale Energy and Climate project (HAMEC). 3: Atmospheric aerosol and cloud microphysics measurements
[PB81-231482] N82-13633

Deposition of aerosol particles in the human respiratory tract N82-13659

Results to be expected from light scattering dust analyzer during a rendezvous mission N82-13999

AEROSPACE MEDICINE

Monocular vision and tactical flight on the helicopter N82-13059

Evaluation of a pilot workload assessment device to test alternate display formats and control handling qualities N82-13062

AEROTHERMODYNAMICS

A real time Pegasus propulsion system model for VSTOL piloted simulation evaluation
[NASA-TM-82770] N82-13144

AFTERBODIES

Aerodynamics of Power Plant Installation
[AGARD-CP-301] N82-13065

A review of the effect of Reynolds number on afterbody drag N82-13080

Aerodynamic aspects of a high bypass ratio engine installation on a fuselage afterbody N82-13093

AFTERBURNING

Cyclic compression, combustion and expansion of a fuel and air mixture in a cylinder containing a catalyst
[PB81-232480] N82-13434

AGGREGATES

A laboratory evaluation of modified asphalt
[PB81-231615] N82-13269

AGING (MATERIALS)

Aging and corrosion problems with flat solar energy absorbers. Study based upon literature and experiment exchanges
[SP-RAPP-1979/4] N82-13548

AGRICULTURAL AIRCRAFT

Raven aircraft filter-absorber --- agricultural aircraft
[AD-A098962] N82-13139

AGRICULTURE

Economic and kinetic studies of the biological production of farm energy and chemicals from biomass
[DE82-000044] N82-13542

AIDS

Linguistic and human performance considerations in the design of an anticipatory communication aid N82-13657

AILERONS

Limited evaluation of an F-14A airplane utilizing an aileron-rudder interconnect control system in the landing configuration
[NASA-TM-81972] N82-13148

AIR CONDITIONING EQUIPMENT

Passive/hybrid solar components: An approach to standard thermal test methods
[PB81-227886] N82-13549

AIR COOLING

An aerodynamic design and the overall stage performance of an air-cooled axial-flow turbine
[NAL-TR-321T] N82-13109

AIR DEFENSE

Decision aids for airborne intercept operations in advanced aircrafts N82-13683

Human supervision and microprocessor control of an optical tracking system N82-13715

AIR FILTERS

Raven aircraft filter-absorber --- agricultural aircraft
[AD-A098962] N82-13139

AIR FLOW

Unsteady aeroelastic modeling and trailing-edge flap control of an experimental wing in a two dimensional wind tunnel N82-13122

AIR INTAKES

Transonic flows in an air inlet with large incidence and the effect of a blowing trap N82-13071

A device for simulating at a compressor bench an air inlet with large incidence N82-13081

An acquisition and analysis system for dynamic tests of air inlets N82-13082

Studies of air inlets at Reynolds numbers comparable to flight in ONERA's F1 and S1MA wind tunnels N82-13091

Airframe-propulsion system aerodynamic interference predictions at high transonic Mach numbers including off-design engine airflow effects N82-13098

The transonic flow field for a fluidic-generator fuze assembly
[AD-A099616] N82-13388

AIR LAND INTERACTIONS

Aircraft measurements and mathematical modeling of the removal of gaseous air pollutants at natural air-land and air-water interfaces N82-13577

AIR POLLUTION

Sulfur in the air in the capital (Helsinki) metropolitan area: ITASAT-project
[RR-614.71] N82-13553

Aircraft data summaries for the SURE intensives, volume 6
[DE82-900355] N82-13563

Tables of statistical summaries for the SURE aircraft measurements
[DE82-900317] N82-13564

Aircraft data summaries for the SURE intensives, volume 1
[DE82-900314] N82-13568

Aircraft data summaries of the SURE intensives, volume 5
[DE82-900310] N82-13570

National Research and Development Program: Environmental air. Summary --- air pollution monitoring and modeling; effects on people and their environment N82-13571

Environmental effects of pollutants from coal combustion. 1: The Four Corners Power Plant, Farmington, N.M.
[PB81-230427] N82-13572

Environmental effects of pollutants from coal combustion. 2: The Colstrip, Montana Power Plant
[PB81-234114] N82-13573

High altitude testing of residential wood-fired combustion equipment
[PB81-226151] N82-13575
Environmental hazard rankings of pollutants generated in coal gasification processes
[PB81-231698] N82-13576
Aircraft measurements and mathematical modeling of the removal of gaseous air pollutants at natural air-land and air-water interfaces N82-13577
Geophysical monitoring for climatic change, number 8: Summary Report, 1979
[PB81-233355] N82-13631

AIR PURIFICATION
Control of methane by ventilation of shafts during raise drilling
[PB81-234502] N82-13487

AIR QUALITY
Sulfur in the air in the capital (Helsinki) metropolitan area: ITASAT-project
[RR-614.71] N82-13553
Infiltration and indoor air quality in energy efficient houses in Eugene, Oregon
[DE82-000971] N82-13561
Aircraft data summaries for the SURE intensives, volume 1
[DE82-900314] N82-13568
Aircraft data summaries of the SURE intensives, volume 4
[DE82-900311] N82-13569
Aircraft data summaries of the SURE intensives, volume 5
[DE82-900310] N82-13570

AIR SAMPLING
Aircraft data summaries for the SURE intensives, volume 6
[DE82-900355] N82-13563

AIR TRAFFIC
Pilot scanning patterns while viewing cockpit displays of traffic information N82-13710

AIR WATER INTERACTIONS
Aircraft measurements and mathematical modeling of the removal of gaseous air pollutants at natural air-land and air-water interfaces N82-13577
Turbulent transfers in the atmospheric surface layer under varied stability conditions. A laboratory study N82-13586

AIRBORNE/SPACEBORNE COMPUTERS
Command-response data transmision to mechanical systems management effect on the crew/system interface N82-13057
The intelligent use of intelligent systems: Problems in engineering man/machine symbiosis N82-13058

AIRCRAFT
The impact of new guidance and control systems on military aircraft cockpit design
[AGARD-CP-312] N82-13048
Prediction of aerodynamic loads on aircrafts with external stores at transonic speeds N82-13813

AIRCRAFT APPROACH SPACING
Modeling of the aircraft in-trail-following task during profile descent N82-13690

AIRCRAFT CONFIGURATIONS
Evaluation of an experimental technique to investigate the effects of the engine position on engine/pylon/wing interference N82-13090
NASA research in aircraft propulsion
[NASA-TM-82771] N82-13146
Comparison of closed loop model with flight test results N82-13691
On the use of the OCM's quadratic objective function as a pilot rating metric N82-13693

AIRCRAFT CONTROL
A standard control display unit for multi-aircraft application N82-13054
An analytical approach for predicting pilot induced oscillations N82-13688
Theoretical linear approach to the combined man-manipulator system in manual control of an aircraft N82-13702

AIRCRAFT DESIGN
The impact of new guidance and control systems on military aircraft cockpit design
[AGARD-CP-312] N82-13048
Aerodynamics of Power Plant Installation
[AGARD-CP-301] N82-13065
The design and development of the Tornado engine air intake N82-13074
Evaluation of an experimental technique to investigate the effects of the engine position on engine/pylon/wing interference N82-13090

AIRCRAFT ENGINES
Aerodynamics of Power Plant Installation
[AGARD-CP-301] N82-13065
Integration of advanced exhaust nozzles N82-13075
A device for simulating at a compressor bench an air inlet with large incidence N82-13081
An acquisition and analysis system for dynamic tests of air inlets N82-13082
Wind tunnel test and analysis techniques using powered simulators for civil nacelle installation drag assessment N82-13088
Establishment of an experimental technique to provide accurate measurement of the installed drag of close coupled civil nacelle/airframe configurations, using a full span model with turbine powered engine simulators N82-13089
Evaluation of an experimental technique to investigate the effects of the engine position on engine/pylon/wing interference N82-13090
Thrust modulation methods for a subsonic V/STOL aircraft
[NASA-TM-82747] N82-13112
A real time Pegasus propulsion system model for VSTOL piloted simulation evaluation
[NASA-TM-82770] N82-13144
Sensor failure detection system --- for the F100 turbofan engine
[NASA-CR-165515] N82-13145

AIRCRAFT EQUIPMENT
Practical aspects of instrumentation system installation, volume 13
[NASA-TM-84067] N82-13140

AIRCRAFT LANDING
Limited evaluation of an F-14A airplane utilizing an aileron-rudder interconnect control system in the landing configuration
[NASA-TM-81972] N82-13148
A comparison of landing maneuver piloting technique based on measurements made in an airline training simulator and in actual flight N82-13685
Identification of multiloop pilot describing functions obtained from simulated approaches to an aircraft carrier N82-13686
Comparison of closed loop model with flight test results N82-13691

AIRCRAFT MANEUVERS
Horizontal conflict resolution maneuvers with a cockpit display of traffic information N82-13671
A comparison of landing maneuver piloting technique based on measurements made in an airline training simulator and in actual flight N82-13685
Comparison of closed loop model with flight test results N82-13691

AIRCRAFT MODELS
Wind tunnel test and analysis techniques using powered simulators for civil nacelle installation drag assessment N82-13088
Establishment of an experimental technique to provide accurate measurement of the installed drag of close coupled civil nacelle/airframe configurations, using a full span model with turbine powered engine simulators N82-13089
Unsteady aeroelastic modeling and trailing-edge flap control of an experimental wing in a two dimensional wind tunnel N82-13122

AIRCRAFT PERFORMANCE
Further tests of a model-based scheme for predicting pilot opinion ratings for large commercial transports N82-13687

AIRCRAFT PILOTS
Texas International Airlines LOFT program N82-13128
Delta Airlines LOFT training N82-13129
Further tests of a model-based scheme for predicting pilot opinion ratings for large commercial transports N82-13687
On the use of the OCM's quadratic objective function as a pilot rating metric N82-13693
Pilot scanning patterns while viewing cockpit displays of traffic information N82-13710

AIRCRAFT RELIABILITY
Helicopter reliability and maintainability trends during development and production
[AD-A105775] N82-13136

AIRCRAFT SAFETY
Issues related to line-oriented flight training N82-13124
Feasibility study of a procedure to detect and warn of low level wind shear
[NASA-CR-3480] N82-13621
An investigation into pilot and system response to critical in-flight events, volume 1
[NASA-CR-166243-VOL-1] N82-13662
An investigation into pilot and system response to critical in-flight events, volume 2
[NASA-CR-166243-VOL-2] N82-13663

AIRCRAFT STRUCTURES
Calculation of wing-body-nacelle interference in subsonic and transonic potential flow N82-13095

AIRCRAFT TIRES
Measured pavement response to transient aircraft loadings N82-13442

AIRCRAFT WAKES
Turbulent wake development behind streamlined bodies N82-13104

AIRFOIL PROFILES
Some observations of surface pressures and the near wake of a blunt trailing edge airfoil N82-13100
Wind-tunnel investigation of the effects of blade tip geometry on the interaction of torsional loads and performance for an articulated helicopter rotor
[NASA-TP-1926] N82-13107
Force measurements on a reflex cambered delta wing
[LOG-C4073] N82-13111
The effect of rotor blade thickness and surface finish on the performance of a small axial flow turbine
[NASA-TM-82726] N82-13114

AIRFOILS
A numerical study of laminar unsteady compressible flow over airfoils N82-13099

AIRFRAMES
The role and implementation of different nacelle/engine simulation concepts for wind-tunnel testing in research and development work on transport aircraft N82-13086
Establishment of an experimental technique to provide accurate measurement of the installed drag of close coupled civil nacelle/airframe configurations, using a full span model with turbine powered engine simulators N82-13089
Airframe-propulsion system aerodynamic interference predictions at high transonic Mach numbers including off-design engine airflow effects N82-13098

ALASKA
Transport and reaction of heavy metals in Alaskan fjord estuaries
[DE81-028319] N82-13474
Alaska's Water resources problems and research needs: Institute of Water Resources, five-year research plan
[PB81-231920] N82-13477
Environmental assessment of the Alaskan Continental Shelf: Annual reports of principal investigators for the year ending March 1980. Volume 5: Hazards
[PB81-225732] N82-13607
Petrology and geochemistry of ophiolite fragments in a tectonic melange, Kodiak Islands, Alaska N82-13610

ALBEDO
Spectrophotometry of faint comets: The asteroid approach N82-13998
Infrared observations of faint comets N82-14001

ALGEBRA
Symbolic reasoning among 3-D models and 2-D images N82-13761
A stochastic extension of the structural properties of compartment models via a Kronecker algebra N82-13810

ALGORITHMS
Regularized integration of gravity-perturbed trajectories: A numerical efficiency study N82-13155
Analysis and behavior of structures on discrete tensionless foundations N82-13286
Topics in digital signal processing N82-13346
Development of an infrared radiative heating model
[NASA-CR-166272] N82-13622
Algorithms for imaging myocardial blood flow using X-ray computed tomography N82-13661
Simple geometric algorithms to aid in clearance management for robotic mechanisms N82-13680

Preemptive scheduling of a multiprocessor system with memories to minimize L sub max
[AD-A103795] N82-13734
Digital data compression algorithm performance comparisions: Proposed NATO standard algorithm provides better facsimile in a noisy communications environment than present Tactical Digital Facsimile algorithm
[AD-A103159] N82-13737
Capacity and coding for computer memory with defects N82-13750
A specification and proof technique for message-based systems and its application to distributed database algorithms N82-13756
Algorithms for the geometry of semi-algebraic sets N82-13763
Research on knowledge based programming and algorithm design
[AD-A105661] N82-13770
Solution of single linear tridiagonal systems and vectorization of the ICOG algorithm on the Cray 1 --- laser fusion
[DE81-025461] N82-13773
Adaptive equalization algorithms for a dispersive channel
[ENST-E-80012] N82-13776
Trellis data compression N82-13784
Solving multiactivity multifacility capacity-constrained 0-1 assignment problems
[AD-A102583] N82-13796
A contribution to robust detection and estimation N82-13809
Parallel scheduling algorithms
[AD-A103796] N82-13820
Transforming contingency tables
[AD-A104182] N82-13821

ALIPHATIC COMPOUNDS
Grafting of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole onto polymers with aliphatic groups. Synthesis and polymerization of 2 (2-hydroxy-5-isopropenylphenyl) 2H-benzotriazole and a new synthesis of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole
[NASA-CR-165016] N82-13171
Creating a safer environment in US coal mines: The Bureau of Mines Methane Control Program, 1964-79
[PB81-233918] N82-13488

ALKALI METALS
Energy levels in and on an oxide film as measured by electrochemical methods
[AD-A103704] N82-13187
High-temperature measurements of alkali levels in an experimental 6-inch AFBC
[DE81-023632] N82-13193

ALKALIES
Electric field-enhanced diffusion and electron stimulated desorption of alkali elements from glass surfaces during electron bombardment and Auger electron analysis N82-13961

ALKALINITY
Endurance test and evaluation of alkaline water electrolysis cells
[NASA-CR-165424] N82-13508

ALKENES
Surface characterization of dispersed supported metal catalysts using a 'time lapse' dynamic pulse technique N82-13177

ALL SKY PHOTOGRAPHY
Three-dimensional mapping of the aurora from digitized all-sky pictures
[REPT-550.388.8] N82-13591

ALLOCATIONS
Solving multiactivity multifacility capacity-constrained 0-1 assignment problems
[AD-A102583] N82-13796

ALTERNATING CURRENT
Bipolar conduction with AC excitation N82-13373
The ac propulsion system for an electric vehicle, phase 1
[NASA-CR-165480] N82-13506
Techniques for energy conservation in ac motor-driven systems
[DE82-900356] N82-13537

ALUMINUM
Deformation-enhanced photoemission from metals N82-13231
Defect structure and properties of intermetallic compound beta-LiAl N82-13959

ALUMINUM ALLOYS
Cyclic deformation and fatigue crack initiation of a coherently precipitating Ni-14.4 at % Al alloy N82-13212
An improved stress corrosion test medium for aluminum alloys
[NASA-TM-82452] N82-13216
Mechanisms by which humidity alters ductility
[AD-A105530] N82-13221
Strengthening phases and deformation mechanisms in dispersion strengthened solid solutions and pure metals N82-13229
Materials studies for magnetic fusion energy applications at low temperatures -4
[PB81-222507] N82-13928
Superconductivity of the A15 compound niobium aluminum N82-13932

ALUMINUM GALLIUM ARSENIDES
Development of high-efficiency cascade solar cells
[DE81-029633] N82-13540

AMMONIUM COMPOUNDS
Constitution of silicate anions in tetraethyl-ammonium silicates and their aqueous solutions
[NRC/CNR-TT-2004] N82-13170

AMMONIUM NITRATES
Nitrogen and phosphorus reactions in overland flow of wastewater
[PB81-239311] N82-13574

AMORPHOUS MATERIALS
Preparation and characterization of hydrogenated amorphous silicon
[DE81-030973] N82-13197
The structural and vibrational properties of amorphous and crystalline group V elements N82-13933

AMPLIFIERS
Double beam-in-time photoacoustic spectroscopy N82-13180
FOA 27 control instruments data system. Control instruments and their functions
[FOA-C-20394-D3] N82-13410

AMPLITUDE DISTRIBUTION ANALYSIS
The formation of radiation patterns of arc antennas N82-13305
Solution of the problem of the synthesis of antennas with the aid of a coherent optical system N82-13313

AMPLITUDE MODULATION
Spectral efficiency of amplitude companded sideband systems N82-13345

ANAEROBES
Economic and kinetic studies of the biological production of farm energy and chemicals from biomass
[DE82-000044] N82-13542

ANALOG CIRCUITS
Design and fabricate a CCD analog multiplier
[AD-A105557] N82-13364
Fiber optic analog and timing monitoring system for the Antares laser fusion program
[DE81-028799] N82-13925

ANALOG TO DIGITAL CONVERTERS
FOA 27 control instruments data system. Control instruments and their functions
[FOA-C-20394-D3] N82-13410

ANALOGIES
Calculation of wing-body-nacelle interference in subsonic and transonic potential flow N82-13095

ANALOGS
Performance of chemical analogs of the explosive CP
[DE81-025836] N82-13251

ANALYSIS (MATHEMATICS)
Preemptive scheduling of a multiprocessor system with memories to minimize L sub max
[AD-A103795] N82-13734
A difference in efficiency between synchronous and asynchronous systems
[AD-A102280] N82-13742
Prediction of aerodynamic loads on aircrafts with external stores at transonic speeds N82-13813

ANALYTIC GEOMETRY
On high beta equilibria of plasmas in the quasi-uniform current model: Influence of shaping the plasma cross section and of the second order in the inverse aspect ratio
[REPT-81-131] N82-13927

ANALYZERS
An apparatus and procedure for calibrating a water vapor analyzer in the 0.1- to 15-ppm range
[PB81-231185] N82-13413

ANGLE OF ATTACK
Consolidation of data base for Army generalized missile model
[NASA-CR-166273] N82-13046
Force and moment, flow-visualization, and boundary-layer tests on a shuttle orbiter model at Mach 6
[NASA-TP-1952] N82-13106
A calculation method for slender wing-body configurations in supersonic flow at high angles of attack --- nonlinear force and pitching moment characteristics
[BMVG-FBWT-79-15] N82-13115
Contributions to the aerodynamics of wing-body configurations in the nonlinear range of angles of attack
[BMVG-FBWT-80-11] N82-13117

ANGULAR DISTRIBUTION
Single mode optical waveguide design investigation
[AD-A098979] N82-13881

ANGULAR RESOLUTION
A possible technique for cometary studies with high angular and spectral resolution N82-14012

ANIONS
Constitution of silicate anions in tetraethyl-ammonium silicates and their aqueous solutions
[NRC/CNR-TT-2004] N82-13170
Spectroelectrochemical investigations in molten salt and aqueous media N82-13183

ANISOTROPY
EBT Stability Theory: Proceedings of the workshop
[DE81-030635] N82-13909
Rudimentary theories of the stability of microwave-heated plasmas N82-13910
Microstability of the EBT boundary N82-13919

ANNEALING
Boron implanted strontium titanate N82-13939
CW laser annealing and CW laser assisted diffusion in gallium arsenide N82-13943

ANNUAL VARIATIONS
Annual cycle energy system experimental performance and national applicability
[DE81-028570] N82-13523

ANNULAR FLOW
Numerical study of multicellular natural convection in vertical cavities N82-13403

ANNULAR NOZZLES
Navier-Stokes solutions for a supersonic coflowing axisymmetric nozzle with a thick annulus N82-13101

ANODES
Insoluble anodes for electrowinning zinc and other metals
[PB81-227365] N82-13227
Endurance test and evaluation of alkaline water electrolysis cells
[NASA-CR-165424] N82-13508

ANODIC STRIPPING
Application of electrochemistry to biochemical problems --- immunoassay technique using differential pulse anodic stripping voltammetry N82-13179

ANTARCTIC REGIONS
Compensation for use of monthly-averaged winds in numerical modeling
[NASA-TM-83855] N82-13623

ANTENNA ARRAYS
Antenna (Selected Articles)
[AD-A106522] N82-13297
Methods of automatic measurement of antenna parameters N82-13299
Antenna (selected articles)
[AD-A106474] N82-13311
Solution of the problem of the synthesis of antennas with the aid of a coherent optical system N82-13313
Antenna (selected articles)
[AD-A106500] N82-13327
Synthesis of nonequidistant line-source antenna by the statistical methods of search N82-13329
Characteristics of antennas with frequency beam swinging N82-13332

ANTENNA COMPONENTS
Antenna (selected articles)
[AD-B060598] N82-13307
Two-mirror antenna for radio relay communication N82-13308
Excitation of radial resonator with annular slot N82-13328
Principles of the construction of systems, which possess potential frequency independence --- antenna design N82-13330

ANTENNA DESIGN
Antenna (selected articles)
[AD-A106476] N82-13294
Cophased directed surface wave splitters using dielectric waveguides N82-13296
Antenna (Selected Articles)
[AD-A106522] N82-13297
Radio astronomical antennas of meter wavelengths N82-13298
Antenna (selected articles)
[AD-A106474] N82-13311
Antenna (selected articles)
[AD-B060573] N82-13318
The development of domestic technology for television transmitting antennas N82-13319
Antenna (selected articles)
[AD-A106500] N82-13327
Principles of the construction of systems, which possess potential frequency independence --- antenna design N82-13330
Characteristics of antennas with frequency beam swinging N82-13332
Experimental and theoretical investigations with laboratory models of phased array antenna
[BMVG-FBWT-79-21] N82-13341

ANTENNA FEEDS
Antenna (selected articles)
[AD-A106476] N82-13294
Cophased directed surface wave splitters using dielectric waveguides N82-13296
Antenna (Selected Articles)
[AD-A106522] N82-13297
Radio astronomical antennas of meter wavelengths N82-13298

ANTENNA RADIATION PATTERNS
High frequency scattering from multiple finite elliptic cylinders N82-13291
Antenna (selected articles)
[AD-A106476] N82-13294
The use of the Kirchoff method for asymptotic solution of a problem of the diffraction of a plane wave on dielectric bodies of revolution N82-13295
Antenna (Selected Articles)
[AD-A106522] N82-13297
Methods of automatic measurement of antenna parameters N82-13299
Antenna (selected articles)
[AD-A106523] N82-13304
The formation of radiation patterns of arc antennas N82-13305
Antenna (selected articles)
[AD-B060598] N82-13307
Use of principle of regularization in direct and mixed problems of the theory of the synthesis of radiating systems N82-13309
Some properties of the radiating aperture superdirectionality N82-13312
Solution of the problem of the synthesis of antennas with the aid of a coherent optical system N82-13313
Thin magnetic impedance antennas N82-13314
Open resonators, formed by confocal mirrors with the variable reflection coefficient and the generalized hyper-spheroidal functions N82-13315
Antenna (selected articles)
[AD-B060573] N82-13318
Radiation of an antenna in the form of a ribbed shaft of finite length N82-13321
One use of methods of the statistical theory of antennas N82-13325
Antenna (selected articles)
[AD-A106500] N82-13327
Excitation of radial resonator with annular slot N82-13328
Synthesis of nonequidistant line-source antenna by the statistical methods of search N82-13329
Principles of the construction of systems, which possess potential frequency independence --- antenna design N82-13330
Natural and mutual conductivities of half-wave slots, arbitrarily oriented on the conducting surface of circular cylinder --- slot antennas N82-13331
Characteristics of antennas with frequency beam swinging N82-13332

ANTENNAS
Shape determination and control for large space structures
[JPL-PUB-81-71] N82-13166
Antenna (selected articles)
[AD-A106500] N82-13327

ANTHROPOMETRY
Anthropometric sizing systems for Army women's field clothing
[AD-A102104] N82-13724

ANTIBODIES
Application of electrochemistry to biochemical problems --- immunoassay technique using differential pulse anodic stripping voltammetry N82-13179

ANTIFOULING
Mitigation of biofouling using coatings
[DE81-027900] N82-13647

ANTIFRICTION BEARINGS
Development of advanced rotor-bearing systems for feedwater pumps, phase 2
[DE82-900376] N82-13431

ANTIGENS
Application of electrochemistry to biochemical problems --- immunoassay technique using differential pulse anodic stripping voltammetry N82-13179

ANTIMONY COMPOUNDS
Development of high-efficiency cascade solar cells
[DE81-029633] N82-13540

ANTIREFLECTION COATINGS
Thermal performance of windows having high solar transmittance
[DE81-028872] N82-13524

ANTITANK MISSILES
Modeling human tracking error in several different anti-tank systems N82-13699

APERTURES
Bounding signal levels at terminations of multiconductor transmission line behind an aperture
[AD-A102031] N82-13362

APPROACH AND LANDING TESTS (STS)
Analysis of a longitudinal pilot-induced oscillation experienced on the approach and landing test of the space shuttle
[NASA-TM-81366] N82-13149

APPROACH CONTROL
Identification of multiloop pilot describing functions obtained from simulated approaches to an aircraft carrier N82-13686

APPROXIMATION
Structural dynamics: Modified calculations --- natural and harmonically excited vibrations of modified structures; increased computation efficiency
[BMVG-FBWT-81-1] N82-13457
High order approximations to Eigensolutions of Sturm-Liouville problems by deferred corrections
[TRITA-NA-8104] N82-13800

APTITUDE
Weighting of aptitude components based on differences in technical school difficulty
[AD-A102045] N82-13725

AQUEOUS SOLUTIONS
Constitution of silicate anions in tetraethyl-ammonium silicates and their aqueous solutions
[NRC/CNR-TT-2004] N82-13170
Electrochemical and spectroscopic studies of some less stable oxidation states of selected lanthanide and actinide elements N82-13182
Spectroelectrochemical investigations in molten salt and aqueous media N82-13183
Fatigue crack initiation and electrochemical behavior of 403 stainless steel in aqueous environments N82-13210
Mechanistic studies of electron exchange kinetics using ab initio
[DE81-026096] N82-13656

AQUIFERS
The occurrence and control of land subsidence due to ground water withdrawal with special reference to the San Joaquin and Santa Clara Valleys, California N82-13466
Analysis of the development of shallow groundwater supplies by pumping from ponds
[PB81-231904] N82-13476
Five-year Hawaii water research agenda, 1982-1987
[PB81-231912] N82-13478
Compressed air energy storage: Preliminary design and site development program in an aquifer. Volume 2: Utility system planning
[DE82-000466] N82-13544

ARCHITECTURE
Pedestrian movement characteristics on building ramps
[PB81-229163] N82-13988

ARCHITECTURE (COMPUTERS)
An analytical study of multiprocessor system reliability N82-13728
Information storage in a decentralized computer system N82-13732
Introduction to the configurable highly parallel computer, revision
[AD-A099776] N82-13735
Concurrent testing and checking in computer systems N82-13751
Automated partitioning of hierarchically specified digital systems N82-13752
Direct execution string processor N82-13753
Design of a real time, interactive, parallel simulation computer N82-13781

ARGON
A study of the formation and structure of small clusters of noble gases and sulfur hexafluoride formed in Laval Nozzle molecular beams N82-13201
Development of technique for AR coating and nickel and copper metallization of solar cells: FPS project, product development
[NASA-CR-165033] N82-13499
Molecular beam electric resonance studies of weakly bound complexes N82-13867
Coexistence of non-registered monolayer and bilayer solid films N82-13931

ARMED FORCES
Laser heat treatment of track components in combat vehicles, phase 1
[AD-A102761] N82-13219

ARSENIC
The structural and vibrational properties of amorphous and crystalline group V elements N82-13933

ARTIFICIAL INTELLIGENCE
The intelligent use of intelligent systems: Problems in engineering man/machine symbiosis N82-13058
Structure of the knowledge base for an expert labeling system N82-13723
Research on knowledge based programming and algorithm design
[AD-A105661] N82-13770

ARTIFICIAL SATELLITES
Conduction and charge storage in electron irradiated spacecraft insulators
[AD-A104796] N82-13167

ARTILLERY
Two-channel telemeter for use in a 3-inch spin air gun
[AD-A102566] N82-13165

ASHES
Environmental effects of pollutants from coal combustion. 1: The Four Corners Power Plant, Farmington, N.M.
[PB81-230427] N82-13572

ASPECT RATIO
Refinement of a method for determining the induced and profile drag of a finite wing from detailed wake measurements N82-13103

ASPHALT
The effects of added softening agents upon the behavior of cold recycled asphalt mixtures
[PB81-231417] N82-13268
A laboratory evaluation of modified asphalt
[PB81-231615] N82-13269

ASSEMBLING
Further developments in integrated circuit assembling technology
[BMFT-FB-T-80-179] N82-13369
Design, fabrication, test, qualification, and price analysis of third generation design solar cell modules
[NASA-CR-165007] N82-13502

ASTEROIDS
Astrometric observations of comets and asteroids and subsequent orbital investigations
[NASA-CR-165004] N82-14039

ASTROMETRY
Modern Observational Techniques for Comets --- conferences
[NASA-CR-165006] N82-13989
Astrometric observations of comets and asteroids and subsequent orbital investigations
[NASA-CR-165004] N82-14039
ASTRONAUT PERFORMANCE
Design and development of a six degree of freedom hand controller N82-13706
ASTRONOMICAL CATALOGS
Existing cometary data and future needs N82-14017
Astronomical data bases and retrieval systems N82-14020
ASTRONOMICAL PHOTOGRAPHY
The JOCR program --- Joint Observatory for Cometary research N82-14013
On observing comets for nuclear rotation N82-14015
Photographic observations of comets at Lowell Observatory --- Halley's comet N82-14016
Outburst and nuclear breakup of Comet Halley - 1910 N82-14018
Near perihelion observations of Comet Halley from Shuttle orbiter N82-14021
ASTRONOMICAL PHOTOMETRY
Modern Observational Techniques for Comets --- conferences
[NASA-CR-165006] N82-13989
Observations of faint comets at McDonald Observatory: 1978-1980 N82-14010
ASTRONOMICAL SPECTROSCOPY
Modern Observational Techniques for Comets --- conferences
[NASA-CR-165006] N82-13989
The spectroscopy of comets: Introductory remarks N82-14004
A systematic program of cometary spectroscopy N82-14005
Ground-based cometary spectroscopy N82-14007
Correlated ground-based and the observations N82-14008
Ultraviolet spectroscopy of comets using sounding rockets, IUE and Spacelab N82-14009
Spectral imagery: Recent results with the SPIFI and their implications for cometary atmospheric studies --- servocontrolled polarimetric imaging Fabry-Perot interferometer N82-14011
A possible technique for cometary studies with high angular and spectral resolution N82-14012
Narrow passband imagery of comets --- Comet West N82-14014
The ESA mission to Comet Halley N82-14025
ASTRONOMICAL TELESCOPES
Observing facilities at the European Southern Observatory (ESO) in Chile for cometary observations N82-14006
Astronomical activities report
[ISSN-0531-4496] N82-14028
ASYMPTOTES
An upper asymptote for the three-parameter logistic item-response model
[AD-A103013] N82-13816
ASYMPTOTIC METHODS
A hybrid method which combines a moment method current with an asymptotic current
[AD-A102199] N82-13340
An upper asymptote for the three-parameter logistic item-response model
[AD-A103013] N82-13816
New exact and asymptotic solutions of the stationary vacuum Einstein equations N82-13973
ATLANTIC OCEAN
Mixed layer depth distributions from SVSTD data
[AD-A105669] N82-13834
ATLAS CENTAUR LAUNCH VEHICLE
Launch mission summary: Intelsat 5 (F3) Atlas/Centaur-55
[NASA-TM-84068] N82-13161
ATMOSPHERIC ATTENUATION
Microwave attenuation and brightness temperature due to the gaseous atmosphere: A comparison of JPL and CCIR values
[NASA-CR-165027] N82-13300
DMSP water vapor radiances: A preliminary evaluation
[AD-A099305] N82-13625
Propagation of sound through the Earth's atmosphere
[NASA-CR-165008] N82-13828
Measurement of sound absorption in the air --- data procesing N82-13829
Detection of infrasound generated by Clear Air Turbulence (CAT) N82-13830
ATMOSPHERIC BOUNDARY LAYER
An experimental study of turbulence in an urban environment N82-13618
ATMOSPHERIC CHEMISTRY
Response of the oceans to increasing atmospheric carbon dioxide
[DE81-028178] N82-13558
Infrared experiments for spaceborne planetary atmospheres research. Full report
[NASA-TM-84414] N82-13876
Infrared experiments for spaceborne planetary atmospheres research. Executive summary
[NASA-TM-84413] N82-13877
ATMOSPHERIC CIRCULATION
Wind Power: Research on network wind power over the Pacific northwest. Executive summary
[DE81-029360] N82-13519
ATMOSPHERIC DIFFUSION
Atmospheric dispersion forecasts at selected locations in the United States
[PB81-230443] N82-13635
ATMOSPHERIC ELECTRICITY
Spring program summary, 1980
[PB81-234940] N82-13628
ATMOSPHERIC MODELS
Microwave attenuation and brightness temperature due to the gaseous atmosphere: A comparison of JPL and CCIR values
[NASA-CR-165027] N82-13300
X-ray and ultraviolet observations of stellar atmospheres N82-14029
An investigation of warm carbon stars N82-14033
ATMOSPHERIC OPTICS
The effects of atmospheric turbulence on the atmospheric transmittance at optical frequencies N82-13608
ATMOSPHERIC PHYSICS
Project Skywater: Fiscal year 1979 report. Atmospheric Resources Research Program
[PB81-234494] N82-13629
ATMOSPHERIC PRESSURE
X-ray and ultraviolet observations of stellar atmospheres N82-14029
ATMOSPHERIC STRATIFICATION
Atmospheric 222Rn measurements at San Nicolas Island during 1980
[AD-A104802] N82-13602
ATMOSPHERIC TURBULENCE
Turbulent transfers in the atmospheric surface layer under varied stability conditions. A laboratory study N82-13586
The effects of atmospheric turbulence on the atmospheric transmittance at optical frequencies N82-13608
ATOM CONCENTRATION
Local density studies of electronic structure and bonding in transition metal compounds N82-13936
ATOMIC COLLISIONS
Atomic pair processes and laser applications N82-13417
Monte Carlo calculations of channeling radiation
[DE81-027655] N82-13818
ATOMIC EXCITATIONS
Outer-shell excitation in sputtered atoms N82-13839
ATOMIC MOBILITIES
Monte Carlo calculations of channeling radiation
[DE81-027655] N82-13818
ATOMIC STRUCTURE
Local density studies of electronic structure and bonding in transition metal compounds N82-13936
Electron band theory and high pressure equation of state
[DE81-027436] N82-13955
Defect structure and properties of intermetallic compound beta-LiAl N82-13959
ATOMS
A comparative study of classical and quantal approaches to thermal and diffusive transport in a dilute atom-diatom binary mixture N82-13868
ATTACK AIRCRAFT
Using voice control onboard combat aircraft N82-13056
A new approach to modeling the cost of ownership for aircraft systems
[AD-A104434] N82-13979
ATTENTION
A model of the human observer and decision maker N82-13714
ATTENUATION
Transmission of sound across a vortex layer enclosing a cylindrical column of jet N82-13838
ATTITUDE CONTROL
On the modeling and control of flexible space structures N82-13168
AUDITORY SIGNALS
Visual/motion cue mismatch in a coordinated roll maneuver
[NASA-CR-166259] N82-13664
AUGER SPECTROSCOPY
Electric field-enhanced diffusion and electron stimulated desorption of alkali elements from glass surfaces during electron bombardment and Auger electron analysis N82-13961
AURORAS
Three-dimensional mapping of the aurora from digitized all-sky pictures
[REPT-550.388.8] N82-13591
AUSTENITIC STAINLESS STEELS
Fatigue crack propagation studies in two cryogenic steels N82-13213
Welding of austenitic stainless steels for liquid-helium service
[DE81-025602] N82-13429
AUTOMATA THEORY
Automated partitioning of hierarchically specified digital systems N82-13752
AUTOMATIC CONTROL
Sensor failure detection system --- for the F100 turbofan engine
[NASA-CR-165515] N82-13145
Further developments in integrated circuit assembling technology
[BMFT-FB-T-80-179] N82-13369
FOA 27 control instruments data system. Control instruments and their functions
[FOA-C-20394-D3] N82-13410
Computer-automated controls for superconducting magnetic energy storage
[DE81-028697] N82-13521
Supervisory control of remote manipulation: A preliminary evaluation N82-13675
Beyond mere automation
[AD-A103838] N82-13736
AUTOMATIC TEST EQUIPMENT
Two-channel telemeter for use in a 3-inch spin air gun
[AD-A102566] N82-13165
Fatigue Test Methodology
[AGARD-LS-118] N82-13274
AUTOMOBILE ENGINES
Performance characteristics of automotive engines in the United States, third series: 1977 Chrysler 318 CID (5.2L), 2V
[PB81-233025] N82-13435
Controlled Speed Accessory Drive demonstration program
[NASA-CR-165010] N82-13981
AUTOMOBILE FUELS
Performance characteristics of automotive engines in the United States, third series: 1977 Chrysler 318 CID (5.2L), 2V
[PB81-233025] N82-13435
Evaluation of techniques for reducing in-use automotive fuel consumption
[PB81-233298] N82-13985
Highway fuel economy study
[PB81-233850] N82-13986
AUTOMOBILES
The influence of motion cues on driver-vehicle performance in a simulator N82-13681
A data collection scheme for identification of parameters in a driver model N82-13696
Manual control analysis of drug effects on driving performance N82-13709
Stability analysis of automobile driver steering control N82-13717
Measures of effectiveness of transportation systems management
[PB81-233884] N82-13984

Weight reduction potential of automobiles and light trucks: 1980 summary source document [PB81-235756] N82-13987

AUTOREGRESSIVE PROCESSES
Computational problems in autoregressive moving average (ARMA) models N82-13698

AUXILIARY POWER SOURCES
A preliminary estimate of future communications traffic for the electric power system [NASA-CR-165015] N82-13493

AVALANCHE DIODES
Three-5 heterostructure avalanche photodiode modules for fiber optic communication links in the 1.0 to 1.3 micrometer spectral range [AD-A099506] N82-13334

AVIONICS
The impact of new guidance and control systems on military aircraft cockpit design [AGARD-CP-312] N82-13048
How the helicopter cockpit designer uses digital avionics N82-13049
Electronic flight deck displays for military transport aircraft N82-13050
Integration of controls and displays in US Army helicopter cockpits N82-13053
A standard control display unit for multi-aircraft application N82-13054
Command-response data transmision to mechanical systems management effect on the crew/system interface N82-13057
Tanker avionics and aircrew complement evaluation N82-13063
Techniques for interfacing multiplex systems [AD-A101457] N82-13135
Electronic master monitor and advisory display system test and demonstration report [AD-A105317] N82-13141
Report on research and technology-FY 1981 [NASA-TM-81367] N82-14047

AXES OF ROTATION
On observing comets for nuclear rotation N82-14015

AXIAL COMPRESSION LOADS
Effective stress-strain-strength behavior of silicate-grouted sand N82-13257

AXIAL FLOW TURBINES
An aerodynamic design and the overall stage performance of an air-cooled axial-flow turbine [NAL-TR-321T] N82-13109

AXISYMMETRIC FLOW
Analysis of the development of shallow groundwater supplies by pumping from ponds [PB81-231904] N82-13476
Investigation of acoustic interactions in jet thrust augmenting ejectors [AD-A106083] N82-13835

AZIMUTH
The formation of radiation patterns of arc antennas N82-13305

AZOLES
Grafting of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole onto polymers with aliphatic groups. Synthesis and polymerization of 2 (2-hydroxy-5-isopropenylphenyl) 2H-benzotriazole and a new synthesis of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole [NASA-CR-165016] N82-13171

B

BACKGROUND RADIATION
Detection of trace gases using high resolution spectroscopy [AD-A104841] N82-13883

BACKSCATTERING
Data on the backscattering coefficients of light ions from solids [IPPJ-AM-18] N82-13907

BALL BEARINGS
Study of methods for applying and enhancing transfer film coatings of polytetrafluoroethylene (PTEE) to Space Shuttle Main Engine (SSME) High Pressure Oxygen Turbo Pump (HPOTP) bearings [NASA-CR-161916] N82-13428

BALLISTIC MISSILES
A comparison of three programs for the calculation of surface-ratio [FOA-C-20392-D8] N82-13779

BALLISTIC TRAJECTORIES
Modeling human tracking error in several different anti-tank systems N82-13699
On the internal target model in a tracking task N82-13700

BALLISTICS
Transitional ballistics of hypervelocity projectiles [BMVG-FBWT-80-1] N82-13163

BAND STRUCTURE OF SOLIDS
Electron band theory and high pressure equation of state [DE81-027436] N82-13955

BANDPASS FILTERS
Narrow passband imagery of comets --- Comet West N82-14014

BANDWIDTH
Visual/motion cue mismatch in a coordinated roll maneuver [NASA-CR-166259] N82-13664

BARRIER LAYERS
Suppression of coal dust explosion by water barrier in a conveyor belt entry [PB81-233306] N82-13489

BASALT
Catalog of lunar mare basalts greater than 40 grams. Part 1: Major and trace chemistry, with megascopic descriptions and rock and thin section photographs [NASA-TM-84065] N82-14040

BASES
System design of the distributed Loop Data Base System (BLDBS) N82-13729

BASES (CHEMICAL)
A study of the surface reactivity of silver: An acid base characterization of oxidation reactions N82-13233

BAYES THEOREM
Application of Bayesian analysis for wind energy site evaluation N82-13619
A Bayesian approach to the symmetric multiple comparisons problem in the two-way balanced design N82-13819

BEAM INTERACTIONS
Numerical study on the interaction between a modulated electron beam and a plasma [IPPJ-543] N82-13906

BEAM WAVEGUIDES
Construction and maintenance of SUNY facilities at the National Synchrotron Light Source [DE81-027855] N82-13152
Antenna (selected articles) [AD-A106499] N82-13323
A statistical analysis of irregular quasi-optical lines (beam guides) with the aid of computer(s) N82-13324

BEAMS (RADIATION)
Properties of matter at ultra-high pressures [DE81-026504] N82-13190
Characteristics of antennas with frequency beam swinging N82-13332
Saturnian kilometric radiation: Source locations [NASA-TM-83846] N82-14038

BEAMS (SUPPORTS)
An experimental study of a reinforced concrete folded plate structure with edge beams N82-13443
Analysis of steel beam-to-column moment connections N82-13444
Moment-strain relationships in elastic-plastic bending of beams [AD-A101722] N82-13446

BEDROCK
Basement rocks of the main interior basins of the midcontinent [NASA-CR-164935] N82-13596

BEDS (PROCESS ENGINEERING)
H-Coal product physical properties measurement [DE81-029095] N82-13245

BENDING MOMENTS
Moment-strain relationships in elastic-plastic bending of beams [AD-A101722] N82-13446

BENEFICIATION
Benefication with magnetic fluids [PB81-227126] N82-13485
Water and energy usage in coal preparation [PB81-238248] N82-13486

BENZENE
Grafting of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole onto polymers with aliphatic groups. Synthesis and polymerization of 2 (2-hydroxy-5-isopropenylphenyl) 2H-benzotriazole and a new synthesis of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole [NASA-CR-165016] N82-13171
Gas-solid chromatography on cation forms of lightly sulfonated porous polymers N82-13237

BERMUDA
The nitrogen cycle and heat budget of a subtropical lagoon, Devils Hole, Harrington Sound, Bermuda: Implications for nitrous oxide production and consumption in marine environments N82-13611

BERYLLIUM
Theoretical equations of state for metals [DE81-028743] N82-13224

BERYLLIUM COMPOUNDS
Observation of high field DHVA effect and induced magnetism in single crystal TiBe sub 2 [DE81-025292] N82-13950

BETA FACTOR
EBT Stability Theory: Proceedings of the workshop [DE81-030635] N82-13909
Effect of Beta limits on reactor performance in EBT N82-13922
On high beta equilibria of plasmas in the quasi-uniform current model: Influence of shaping the plasma cross section and of the second order in the inverse aspect ratio [REPT-81-131] N82-13927

BIBLIOGRAPHIES
Aeronautical engineering: A continuing bibliography with indexes, supplement 140 --- October 1981 [NASA-SP-7037(140)] N82-13044
Compilation of abstracts of dissertations theses, and research papers submitted by candidates for degrees, 1 October 1979 - 30 September 1980 [AD-A104124] N82-13974

BICRYSTALS
Fundamental studies of grain-boundary passivation in polycrystalline silicon with application to improved photovoltaic devices [DE82-000825] N82-13956

BINARY CODES
Capacity and coding for computer memory with defects N82-13750

BINARY MIXTURES
Solubilities in multicomponent systems of nonspecific interactions N82-13205
A comparative study of classical and quantal approaches to thermal and diffusive transport in a dilute atom-diatom binary mixture N82-13868

BINARY STARS
Evolution of close binary systems: Observational aspects [NASA-CR-165039] N82-14027

BINDERS (MATERIALS)
A laboratory evaluation of modified asphalt [PB81-231615] N82-13269

BIOCONVERSION
Environmental and economic comparison of advanced processes for conversion of coal and biomass into clean energy [PB81-234239] N82-13256
Biomethanation of biomass pyrolysis gases [DE82-000238] N82-13541

BIODEGRADATION
Mitigation of biofouling using coatings [DE81-027900] N82-13647

BIODYNAMICS
Determination of efficient methods of lift by comparing trained and untrained male and female lifters [AD-A100349] N82-13650

BIOENGINEERING
Pupillometry, a bioengineering overview N82-13711

BIOLOGICAL EFFECTS
National Research and Development Program: Environmental air. Summary --- air pollution monitoring and modeling; effects on people and their environment N82-13571
Metabolism summaries of selected halogenated organic compounds in human and environmental media, a literature survey: First update [PB81-232811] N82-13655

BIOLOGICAL MODELS (MATHEMATICS)
Model simulation studies to clarify the effect on saccadic eye movements of initial condition velocities set by the Vestibular Ocular Reflex (VOR) N82-13712
Benefits of detailed models of muscle activation and mechanics N82-13713
BIOMASS ENERGY PRODUCTION
Environmental and economic comparison of advanced processes for conversion of coal and biomass into clean energy
[PB81-234239] N82-13256
Solar-central-receiver fuels and chemicals
[DE82-000941] N82-13530
Technology assessment of solar energy systems: Availability and impacts of woody biomass utilization in the Pacific Northwest
[DE82-000705] N82-13535
Biomass energy systems: Descriptions and employment requirements for typical operations
[DE82-000236] N82-13538
Biomethanation of biomass pyrolysis gases
[DE82-000238] N82-13541
Economic and kinetic studies of the biological production of farm energy and chemicals from biomass
[DE82-000044] N82-13542
Treatment of biomass gasification wastewaters using reverse osmosis
[DE82-000698] N82-13566
Treatment of biomass-gasification wastewaters by wet-air oxidation
[DE82-000935] N82-13567
BIOPHYSICS
Benefits of detailed models of muscle activation and mechanics N82-13713
BIOSYNTHESIS
Biomethanation of biomass pyrolysis gases
[DE82-000238] N82-13541
BIPOLARITY
Bipolar conduction with AC excitation N82-13373
BLADE TIPS
Wind-tunnel investigation of the effects of blade tip geometry on the interaction of torsional loads and performance for an articulated helicopter rotor
[NASA-TP-1926] N82-13107
BLAST LOADS
Computer program for optimum nonlinear dynamic design of reinforced concrete slabs under blast loading (CBARCS)
[AD-A104253] N82-13262
Electronic measurement of airblast overpressure
[AD-A105379] N82-13389
BLOOD FLOW
A monitor for noninvasive estimation of pulmonary blood flow N82-13656
Algorithms for imaging myocardial blood flow using X-ray computed tomography N82-13661
BLUNT BODIES
Aerodynamic heating on the corrugated surface of a 10.2 deg half-angle blunted cone at Mach 6.7
[NASA-TP-1928] N82-13383
BLUNT TRAILING EDGES
Some observations of surface pressures and the near wake of a blunt trailing edge airfoil N82-13100
BODY FLUIDS
The measurements of fluid shifts and of the tissue compliance along body axis in man
[BMFT-FB-W-80-011] N82-13654
BODY KINEMATICS
Determination of efficient methods of lift by comparing trained and untrained male and female lifters
[AD-A100349] N82-13650
BODY MEASUREMENT (BIOLOGY)
Anthropometric sizing systems for Army women's field clothing
[AD-A102104] N82-13724
BODY SIZE (BIOLOGY)
Anthropometric sizing systems for Army women's field clothing
[AD-A102104] N82-13724
BODY-WING CONFIGURATIONS
The influence of closed-coupled, rear fuselage mounted nacelles on the design of an advanced high speed wing N82-13092
A calculation method for slender wing-body configurations in supersonic flow at high angles of attack --- nonlinear force and pitching moment characteristics
[BMVG-FBWT-79-15] N82-13115
Contributions to the aerodynamics of wing-body configurations in the nonlinear range of angles of attack
[BMVG-FBWT-80-11] N82-13117
BOILERS
Workshop proceedings: Corrosion of Inconel 600 Steam Generator Tubing in the Tubesheet Crevice
[DE81-903554] N82-13226
Workshop proceedings: U-bend tube cracking in steam generators
[DE81-903765] N82-13515
Evaluation of creep-fatigue life-prediction models for the solar central receiver
[DE82-000942] N82-13529
Optical scanner system for internal inspection of steam-generator tubes
[EPRI-NP-1944] N82-13884
BOLTZMANN TRANSPORT EQUATION
A comparative study of classical and quantal approaches to thermal and diffusive transport in a dilute atom-diatom binary mixture N82-13868
BONE MARROW
Absorbed dose to active red bone marrow from diagnostic and therapeutic uses of radiation
[ARL-TR-021] N82-13651
BORON
Boron implanted strontium titanate N82-13939
BORON CARBIDES
Helium diffusion in irradiated boron carbide
[DE81-027848] N82-13951
BOROSILICATE GLASS
A preliiminary analysis of the data from experiment 77-13 and final report on glass fining experiments in zero gravity
[NASA-CR-161884] N82-13154
BOSONS
The hadronic decay rate of the Higgs boson: An application of the running mass N82-13842
BOUNDARIES
The missing boundary problem for smooth manifolds of dimension greater than or equal to six N82-13806
BOUNDARY LAYER CONTROL
An experimental study of Tollmien-Schlichting wave cancellation --- friction drag reduction N82-13120
BOUNDARY LAYER EQUATIONS
Application of the method of weighted residuals to the boundary layer momentum and turbulent stress transport equations N82-13374
BOUNDARY LAYER FLOW
Calculation of transonic air-intakes using a computer package for inviscid and boundary layer flows N82-13072
An experimental investigation of the turbulent flow in the junction of a flat plate and a body of constant thickness N82-13102
Force and moment, flow-visualization, and boundary-layer tests on a shuttle orbiter model at Mach 6
[NASA-TP-1952] N82-13106
An analytical and experimental study of the steady and unsteady airloads on a wing with oscillating control including a streamlined gap --- wind tunnel test
[DFVLR-FB-81-18] N82-13119
An experimental study of Tollmien-Schlichting wave cancellation --- friction drag reduction N82-13120
BOUNDARY LAYERS
A review of the effect of Reynolds number on afterbody drag N82-13080
Microstability of the EBT boundary N82-13919
BOUNDARY VALUE PROBLEMS
A nonlinear conservation law with memory --- history boundary value problems in viscoelastic motion
[AD-A103882] N82-13791
Solution of initial-value problems for some infinite eventually periodic chains of harmonic oscillators N82-13807
BRAKING
The influence of high temperature on braking --- wheel brakes N82-13433
BRANCHING (MATHEMATICS)
An extension to N dimensions of the Von Karman equations N82-13441
On the buckling force of floating ice plates
[AD-A103733] N82-13472
Solving multiactivity multifacility capacity-constrained 0-1 assignment problems
[AD-A102583] N82-13796
BRAYTON CYCLE
Manual for the program CASLE: Cycle analysis and second-life evaluation
[DE81-027487] N82-13971
BRAZING
Dynamic mass spectrometry: A residual gas analysis method and some applications
[DE81-026230] N82-13195
BREADBOARD MODELS
Experimental and theoretical investigations with laboratory models of phased array antenna
[BMVG-FBWT-79-21] N82-13341
BREEDER REACTORS
Assessment of the computer code COBRA/CFTL --- for thermal-hydraulic analysis of simulated gas-cooled fast breeder reactor cores
[DE81-027933] N82-13771
BRIDGES (STRUCTURES)
Inelastic overload analysis of continuous steel multi-girder highway bridges by the finite-element method N82-13440
Effects of restrained thermal movement in a continuous, prestressed concrete bridge without interior expansion joints N82-13461
BRIGHTNESS
Spectrophotometry of faint comets: The asteroid approach N82-13998
A systematic program of cometary spectroscopy N82-14005
Outburst and nuclear breakup of Comet Halley - 1910 N82-14018
Optical brightness variations in a sample of nineteen radio-quiet quasi-stellar objects N82-14030
BRIGHTNESS TEMPERATURE
Microwave attenuation and brightness temperature due to the gaseous atmosphere: A comparison of JPL and CCIR values
[NASA-CR-165027] N82-13300
Detection of trace gases using high resolution spectroscopy
[AD-A104841] N82-13883
BROADBAND
Principles of the construction of systems, which possess potential frequency independence --- antenna design N82-13330
Planetary radio astronomy observations from Voyager-2 near Saturn
[NASA-TM-83856] N82-14037
BUBBLE TECHNIQUE
Reduction of nitric oxide in a fluidized bed
[DE81-030488] N82-13198
BUBBLES
A preliiminary analysis of the data from experiment 77-13 and final report on glass fining experiments in zero gravity
[NASA-CR-161884] N82-13154
Two studies of fluidized beds: Heat transfer and grid jets N82-13203
BUCKLING
On the buckling force of floating ice plates
[AD-A103733] N82-13472
BUMPY TORUSES
EBT Stability Theory: Proceedings of the workshop
[DE81-030635] N82-13909
Rudimentary theories of the stability of microwave-heated plasmas N82-13910
Review of recent EBT coupled ring-core stability theory N82-13911
Brief survey of experimental investigation of instabilities in microwave-heated plasmas N82-13912
Fluctuation measurements in EBT N82-13913
Eigenmode stability analysis for a bumpy torus N82-13915
Numerical solutions of the EBT Radial eigenmode problem N82-13916
Stability of hot electron plasma in the ELMO bumpy torus N82-13917
Analytical theory of interchange and compressional Alfven instabilities in EBT N82-13918
Microstability of the EBT boundary N82-13919
Kinetic stability analyses in a bumpy cylinder N82-13921
Effect of Beta limits on reactor performance in EBT N82-13922

BURNING RATE
Test number 2 of propellants for rocket motor E573
[FOA-C-20411-D1] N82-13254

BURSTS
Outburst and nuclear breakup of Comet Halley - 1910 N82-14018

BUTADIENE
Investigation of test methods, material properties, and processes for solar cell encapsulants
[NASA-CR-165031] N82-13503

BY-PRODUCTS
Power-plant fly-ash utilization: A chemical-processing perspective
[DE81-025452] N82-13191

BYPASS RATIO
The role and implementation of different nacelle/engine simulation concepts for wind-tunnel testing in research and development work on transport aircraft N82-13086
Aerodynamic aspects of a high bypass ratio engine installation on a fuselage afterbody N82-13093

C

C-141 AIRCRAFT
Submillimeter observations of solar limb-brightening in the total solar eclipse of 31 July 1981 N82-14043

CADMIUM
The trace metal stratigraphy and recent sedimentary history of anthrogenous particulates on the San Pedro Shelf, California N82-13579

CADMIUM TELLURIDES
HgCdTe fabrication using directed energy techniques
[AD-A105626] N82-13947

CALCIUM COMPOUNDS
Colloidal properties of coagulated calcium-montmorillonite suspensions N82-13609

CALCULATORS
SEASAT equator crossing program
[AD-A099442] N82-13156

CALCULUS
Analysis of coupled translational and rotational diffusion using operator calculus N82-13849

CALIBRATING
Wind tunnel test and analysis techniques using powered simulators for civil nacelle installation drag assessment N82-13088
Practical aspects of instrumentation system installation, volume 13
[NASA-TM-84067] N82-13140
JASPIC-DIP: The digital impedance probe in the JASPIC project
[BMFT-FB-W-80-034] N82-13169
An apparatus and procedure for calibrating a water vapor analyzer in the 0.1- to 15-ppm range
[PB81-231185] N82-13413
Requirements for an effective National Nonionizing Radiation Measurement System
[PB81-223455] N82-13414
Calibration of probabilities: The state of the art to 1980
[AD-A101986] N82-13817

CALIFORNIA
Program planner's guide to geothermal development in California
[DE82-000700] N82-13527
The trace metal stratigraphy and recent sedimentary history of anthrogenous particulates on the San Pedro Shelf, California N82-13579
Recurrence intervals and recency of faulting along the San Gregorio fault zone, San Mateo County, California N82-13581
Atmospheric 222Rn measurements at San Nicolas Island during 1980
[AD-A104802] N82-13602
Biological and physical oceanographic observations pertaining to the trawl fishery in a region of persistent coastal upwelling
[NASA-TM-81332] N82-13637

CAMBERED WINGS
Force measurements on a reflex cambered delta wing
[LOG-C4073] N82-13111

CAMERA SHUTTERS
Electrooptic shutter devices utilizing PLZT ceramic wafers
[DE81-025470] N82-13885

CANARD CONFIGURATIONS
Consolidation of data base for Army generalized missile model
[NASA-CR-166273] N82-13046

CAP CLOUDS
The Sierra Cooperative Pilot Project: Precipitation management research in the Sierra Nevada
[PB81-234452] N82-13630

CAPACITANCE
Charge-based modeling of capacitance in MOS transistors N82-13350

CAPACITORS
Charge-based modeling of capacitance in MOS transistors N82-13350

CAPILLARY FLOW
Heat pipe startup from the supercritical state N82-13400

CARBON
The trace metal stratigraphy and recent sedimentary history of anthrogenous particulates on the San Pedro Shelf, California N82-13579

CARBON CYCLE
Energy generation and the sulfur-carbon cycle
[DE81-030949] N82-13562
On the inadequacy of one dimensional ocean models for the global carbon cycle
[CM-51] N82-13643

CARBON DIOXIDE
Response of the oceans to increasing atmospheric carbon dioxide
[DE81-028178] N82-13558

CARBON DIOXIDE LASERS
Laser heat treatment of track components in combat vehicles, phase 1
[AD-A102761] N82-13219
Long-term operation of a sealed waveguide CO sub 2 laser
[AD-A105261] N82-13420
Surface failure of CO2 laser irradiated glass
[AD-A105454] N82-13421
Fiber optic analog and timing monitoring system for the Antares laser fusion program
[DE81-028799] N82-13925

CARBON MONOXIDE
Control of hydrocarbons and carbon monoxide via catalytic incineration
[DE82-000508] N82-13560

CARBON STARS
An investigation of warm carbon stars N82-14033

CARBON STEELS
Rapid cycle casting of steel
[AD-A103567] N82-13260

CARDIOVASCULAR SYSTEM
Superconducting magnetometry for cardiovascular studies and an application of adaptive filtering N82-13648

CARRIER TO NOISE RATIOS
Transport noise arising from diffusion and bulk or surface generation recombination in semiconductors N82-13963

CARRIER TRANSPORT (SOLID STATE)
Transport noise arising from diffusion and bulk or surface generation recombination in semiconductors N82-13963
The growth and carrier transport properties of sputter deposited GaAs thin films doped with silicon and magnesium N82-13965

CARTESIAN COORDINATES
Interpolating for the location of remote sensor data
[NASA-TM-82169] N82-13469

CASCADE FLOW
Computation of unsteady two-dimensional inviscid flow in turbomachinery cascades N82-13401

CASTING
Rapid cycle casting of steel
[AD-A103567] N82-13260

CASTOR OIL
Some experiences with the use of castor oil as a dielectric
[AD-A102348] N82-13363

CATALOGS (PUBLICATIONS)
Catalog of lunar mare basalts greater than 40 grams. Part 1: Major and trace chemistry, with megascopic descriptions and rock and thin section photographs
[NASA-TM-84065] N82-14040

CATALYSTS
Surface characterization of dispersed supported metal catalysts using a 'time lapse' dynamic pulse technique N82-13177
Preparation, characterization and performance of non-uniform metal catalysts N82-13204
Endurance test and evaluation of alkaline water electrolysis cells
[NASA-CR-165424] N82-13508
Control of hydrocarbons and carbon monoxide via catalytic incineration
[DE82-000508] N82-13560

CATALYTIC ACTIVITY
Catalytic combustion of residual fuels
[NASA-TM-82731] N82-13504
Transient catalytic combustor model
[NASA-CR-165324] N82-13507

CATHODE RAY TUBES
Electronic flight deck displays for military transport aircraft N82-13050
Color CRT displays for the cockpit N82-13051

CATIONS
Gas-solid chromatography on cation forms of lightly sulfonated porous polymers N82-13237

CAVITIES
Numerical study of multicellular natural convection in vertical cavities N82-13403

CEILINGS (METEOROLOGY)
Atmospheric dispersion forecasts at selected locations in the United States
[PB81-230443] N82-13635

CELESTIAL BODIES
Reports of Planetary Geology Program, 1981
[NASA-TM-84211] N82-14041

CELLULOSE
Economic and kinetic studies of the biological production of farm energy and chemicals from biomass
[DE82-000044] N82-13542

CELLULOSE NITRATE
Investigations towards the understanding of surface treatment of propellant grains by means of trace elements
[BMVG-FBWT-79-14] N82-13253

CEMENTS
Micromechanics of expansive mechanisms in expansive cement concretes N82-13258
Construction of a recycled Portland cement concrete pavement — Connecticut expressway
[PB81-233553] N82-13267

CENTER OF PRESSURE
An approximate analytical method for vortex-lift and center of pressure on the slender wing
[NASA-TM-83198] N82-13045

CENTIMETER WAVES
Directed dividers on the metal-dielectric waveguides N82-13326

CERAMICS
Electrooptic shutter devices utilizing PLZT ceramic wafers
[DE81-025470] N82-13885

CERENKOV RADIATION
Inverse cerenkov interaction between relativistic electrons and laser light N82-13425
A vacuum ultraviolet radiation source using Cerenkov radiation N82-13894

CERTIFICATION
COBOL compiler: Northern Telecom, Inc. NTI COBOL/3
[PB81-226417] N82-13749

CESIUM COMPOUNDS
Effects of pressure on the mixed valent properties of Ce and its intermetallic compounds
[DE81-028572] N82-13953

CESIUM VAPOR
Three laser experiments in gases N82-13416

CHANNELS (DATA TRANSMISSION)
Command-response data transmision to mechanical systems management effect on the crew/system interface N82-13057
Techniques for interfacing multiplex systems
[AD-A101457] N82-13135
Adaptive equalization algorithms for a dispersive channel
[ENST-E-80012] N82-13776

CHARACTERIZATION
The internal structure of the magnetopause [AERONOMICA-ACTA-A-221-1980] N82-13589

CHARGE CARRIERS
A stochastic Langevin dynamics study of correlated ionic motion in one-dimensonal framework solid electrolytes N82-13966

CHARGE COUPLED DEVICES
Design and fabricate a CCD analog multiplier [AD-A105557] N82-13364

CHARGE DISTRIBUTION
Bipolar conduction with AC excitation N82-13373

CHARGE TRANSFER
Laser induced charge transfer collisions N82-13418

CHARGED PARTICLES
Electrostatic and hydrodynamic interactions of charged macromolecular systems N82-13242
Laser induced charge transfer collisions N82-13418
Camelot: A novel concept for a multiterawatt pulse power generator for single pulse burst or repetition rate operation [AD-A103024] N82-13513
Inclusive charged particle spectrum from the interaction of nuclei with intermediate energy proton N82-13848
Inelastic scattering of high energy muons from nuclear targets N82-13874
Charge trapping in interface doped MNOS structures N82-13930

CHEMICAL ANALYSIS
Workshop proceedings: Corrosion of Inconel 600 Steam Generator Tubing in the Tubesheet Crevice [DE81-903554] N82-13226
Beyond mere automation [AD-A103838] N82-13736

CHEMICAL ATTACK
Rates and mechanisms of chemical weathering in an organic environment at Panolo Mountain, Georgia N82-13615

CHEMICAL BONDS
Constitution of silicate anions in tetraethyl-ammonium silicates and their aqueous solutions [NRC/CNR-TT-2004] N82-13170
Molecular interactions in amphiphilic association structures N82-13206
Molecular beam electric resonance studies of weakly bound complexes N82-13867
The structural and vibrational properties of amorphous and crystalline group V elements N82-13933
Local density studies of electronic structure and bonding in transition metal compounds N82-13936

CHEMICAL COMPOSITION
Observing chemical abundances in comets N82-13990
Observational data needs useful for modeling the coma N82-13991
Ground-based photometry of comets in the spectral interval 3000 to 3500 angstrom N82-13997

CHEMICAL PROPERTIES
Solar-central-receiver fuels and chemicals [DE82-000941] N82-13530

CHEMICAL PROPULSION
Low-thrust chemical propulsion system pump technology [NASA-CR-165219] N82-13427

CHEMICAL REACTIONS
The chemistry of saline water chlorination N82-13178
Preparation, characterization and performance of non-uniform metal catalysts N82-13204
Polymers with mesomorphic organization in the side chains from vinyl monomers with mesogenic or potentially mesogenic elements N82-13234
Energy generation and the sulfur-carbon cycle [DE81-030949] N82-13562
Role of molecular dynamics on descriptions of shock front processes [DE81-028687] N82-13857

CHEMICAL REACTORS
Controlled-flash pyrolysis [DE82-000284] N82-13196
Catalytic combustion of residual fuels [NASA-TM-82731] N82-13504

CHEMICAL TESTS
An improved stress corrosion test medium for aluminum alloys [NASA-TM-82452] N82-13216
Testing and evaluation of MHD materials and substructures [DE81-024331] N82-13926

CHIPS (ELECTRONICS)
Further developments in integrated circuit assembling technology [BMFT-FB-T-80-179] N82-13369

CHLORIDES
Stress corrosion cracking of type 304 stainless steel in high temperature dilute chloride solution N82-13228

CHLORINATION
The chemistry of saline water chlorination N82-13178

CHLORINE
Evaluation of low-chlorine TATB from a production source [DE81-025474] N82-13249

CHOLESTEROL
Nonlinear optical effects in liquid crystals N82-13937

CHONDRITES
Potassium-argon and iodine-xenon gas retention ages of enstatite chondrite meteorites N82-14036

CHROMIUM
The trace metal stratigraphy and recent sedimentary history of anthrogenous particulates on the San Pedro Shelf, California N82-13579

CHROMIUM OXIDES
Quantitative investigations of mixed oxidation states of some first row transition metals in insulator matrices by photoelectron spectroscopy N82-13184

CIRCUIT BREAKERS
High voltage DC switchgear development for multi-kW space power system: Aerospace technology development of three types of solid state power controllers for 200-1100VDC with current ratings of 25, 50, and 80 amperes with one type utilizing an electromechanical device [NASA-CR-165413] N82-13357

CIRCUIT DIAGRAMS
Direct digital simulation of power semiconductor-controlled electrical machines N82-13355

CIRCUIT PROTECTION
Distributed photovoltaic systems: Utility interface issues and their present status [NASA-CR-165019] N82-13492

CIRCULAR CYLINDERS
Effects of intake geometry on circular pitot intake performance at zero and low forward speeds N82-13070
An experimental investigation of the flow past a finite circular cylinder at a low subcritical Reynolds number N82-13105
Natural and mutual conductivities of half-wave slots, arbitrarily oriented on the conducting surface of circular cylinder --- slot antennas N82-13331

CIRCULAR TUBES
Experimental and analytical investigation of a fluidic power generator [JPL-PUB-81-100] N82-13386

CITIES
An experimental study of turbulence in an urban environment N82-13618

CIVIL AVIATION
Guidelines for line-oriented flight training, volume 2 [NASA-CP-2184-VOL-2] N82-13123
Issues related to line-oriented flight training N82-13124
Line-oriented flight training: Northwest Airlines N82-13125
United Airlines LOFT training N82-13126
Eastern Airlines LOFT program N82-13127
Texas International Airlines LOFT program N82-13128
Delta Airlines LOFT training N82-13129
American Airlines LOFT evaluation program N82-13130
Group 1: Scenario design and development issues N82-13131
Group 2: Real time LOFT operations N82-13132

CLADDING
Asymmetric stress and failure analysis [DE81-026842] N82-13451

CLASSIFICATIONS
On the dependence of the growth of an entire function of the distribution of the zeros of its derivatives and a conjecture of G. Polya N82-13805

CLAYS
Colloidal properties of coagulated calcium-montmorillonite suspensions N82-13609

CLEAN ENERGY
Environmental and economic comparison of advanced processes for conversion of coal and biomass into clean energy [PB81-234239] N82-13256

CLEAR AIR TURBULENCE
Feasibility study of a procedure to detect and warn of low level wind shear [NASA-CR-3480] N82-13621
Detection of infrasound generated by Clear Air Turbulence (CAT) N82-13830

CLIMATOLOGY
Regional hydrologic models for climatology: An application to three Wisconsin watersheds N82-13467

CLOCKS
Electronic master monitor and advisory display system test and demonstration report [AD-A105317] N82-13141

CLOUD GLACIATION
Field tests of a surface ice accretion measurement system [AD-A100282] N82-13624

CLOUD PHYSICS
Hawaii Mesoscale Energy and Climate project (HAMEC). 3: Atmospheric aerosol and cloud microphysics measurements [PB81-231482] N82-13633

CLOUD SEEDING
Project Skywater: Fiscal year 1979 report. Atmospheric Resources Research Program [PB81-234494] N82-13629
The Sierra Cooperative Pilot Project: Precipitation management research in the Sierra Nevada [PB81-234452] N82-13630

CLOUDS
Magnetic clouds between 2-4 AU: Voyager observations [NASA-TM-83849] N82-13593
Detection of trace gases using high resolution spectroscopy [AD-A104841] N82-13883

CLUMPS
A study of the formation and structure of small clusters of noble gases and sulfur hexafluoride formed in Laval Nozzle molecular beams N82-13201
Some small sample non-parametric space-time clustering tests N82-13811

CMOS
Effect of gate oxide thickness on the radiation hardness of silicon-gate CMOS [DE81-027202] N82-13366

COAL
Power-plant fly-ash utilization: A chemical-processing perspective [DE81-025452] N82-13191
Controlled-flash pyrolysis [DE82-000284] N82-13196
Environmental and economic comparison of advanced processes for conversion of coal and biomass into clean energy [PB81-234239] N82-13256
Three Bureau of Mines optical dust probes [PB81-231441] N82-13412
Water and energy usage in coal preparation [PB81-238248] N82-13486
Environmental effects of pollutants from coal combustion. 2: The Colstrip, Montana Power Plant [PB81-234114] N82-13573
Pyrolytic characterization of the organic matter in selected coals and in the Devonian shales of southern West Virginia N82-13578
A depositional model for major coal seams in the Rock Springs Formation, Upper Cretaceous, southwest Wyoming N82-13580

COAL GASIFICATION
Soviet UCG experience specifically related to field experiments in the United States [DE81-028642] N82-13244
Low/medium Btu coal gasification assessment program for potential users in New Jersey: Executive summary [DE81-025475] N82-13247

Low-Btu gasification of coal for electric power generation, phase 1, 2, and 3
[DE81-029482] N82-13248
Solar-central-receiver fuels and chemicals
[DE82-000941] N82-13530
Environmental hazard rankings of pollutants generated in coal gasification processes
[PB81-231698] N82-13576

COAL LIQUEFACTION
Controlled-flash pyrolysis
[DE82-000284] N82-13196
H-Coal product physical properties measurement
[DE81-029095] N82-13245
Environmental and economic comparison of advanced processes for conversion of coal and biomass into clean energy
[PB81-234239] N82-13256

COASTAL ECOLOGY
Ecology and distribution of the Benthic community on the Monterey Breakwater, Monterey, California
[AD-A102047] N82-13555

COASTAL WATER
The propagation of inertial-internal waves in coastal upwelling regions N82-13645

COATING
Study of methods for applying and enhancing transfer film coatings of polytetrafluoroethylene (PTEE) to Space Shuttle Main Engine (SSME) High Pressure Oxygen Turbo Pump (HPOTP) bearings
[NASA-CR-161916] N82-13428

COBALT
An investigation of the nickel-cobalt occurrence in the southeast Missouri mining district N82-13613

COBOL
Digital Equation Corporation PDP-11 COBOL, version 4.1
[PB81-232423] N82-13746
Digital equipment corporation, PDP-11 COBOL version, 4.1 indexed 1-0 module
[PB81-232415] N82-13747
Sperry Univac ASCII COBOL level 5R2
[PB81-228892] N82-13748
COBOL compiler: Northern Telecom, Inc. NTI COBOL/3
[PB81-226417] N82-13749

COCKPITS
The impact of new guidance and control systems on military aircraft cockpit design
[AGARD-CP-312] N82-13048
How the helicopter cockpit designer uses digital avionics N82-13049
Electronic flight deck displays for military transport aircraft N82-13050
Color CRT displays for the cockpit N82-13051
Integration of controls and displays in US Army helicopter cockpits N82-13053
F/A 18 Hornet crew station N82-13064
Modeling of the aircraft in-trail-following task during profile descent N82-13690
Functional structure and dynamics of the human nervous system N82-13692

CODING
Digital video bandwidth compression systems employing block truncation coding N82-13290
Capacity and coding for computer memory with defects N82-13750

COGNITION
Pupillometric measurement of operator workload N82-13666
The cognitive demands of second order manual control: Applications of the event related brain potential N82-13667
Identification of cognitive factors related to remote work performance using closed circuit TV displays N82-13679

COHERENT LIGHT
Theory and calculation of Raman line shapes and excitation profiles near a one photon resonance N82-13866

COHERENT RADIATION
Solution of the problem of the synthesis of antennas with the aid of a coherent optical system N82-13313

COHERENT SCATTERING
Defect studies of molecular and rare-gas crystals down to 50mK and up to 150 MPa
[DE81-026617] N82-13949

COLD FLOW TESTS
Flow characteristics of a multiple nozzle exhaust gas eductor system
[AD-A104072] N82-13387

COLD WORKING
Load and resistance factor design of cold-formed steel structural members N82-13464

COLLIMATION
Head up displays N82-13052

COLLISION PARAMETERS
Laser induced charge transfer collisions N82-13418

COLLISIONLESS PLASMAS
Ion cyclotron resonance heating and its effect on confinement in Tokamaks N82-13896

COLLISIONS
New problems of cometary observations from space N82-13994

COLLOCATION
Simulation studies on the computation of the gravity vector in space from surface data considering the topography of the Earth N82-13612

COLLOIDS
Colloidal properties of coagulated calcium-montmorillonite suspensions N82-13609

COLOR
Intermediate band surface photometry of elliptical galaxies N82-14035

COLUMNS (SUPPORTS)
Analysis of steel beam-to-column moment connections N82-13444

COMBAT
Use of a helmet-mounted matrix display for presenting energy-maneuverability information during simulated close combat N82-13061

COMBINED CYCLE POWER GENERATION
Experimental and analytical systems studies of a combined thermal-photovoltaic residential solar system
[DE81-029539] N82-13534

COMBUSTION CHAMBERS
Gas turbine combustor soot and radiation N82-13174
High-temperature measurements of alkali levels in an experimental 6-inch AFBC
[DE81-023632] N82-13193
Catalytic combustion of residual fuels
[NASA-TM-82731] N82-13504
Transient catalytic combustor model
[NASA-CR-165324] N82-13507
Gas-turbine critical research and advanced technology support project
[NASA-TM-81708] N82-13509
Testing and evaluation of MHD materials and substructures
[DE81-024331] N82-13926
Update on Specified European R and D Efforts. Part 1: Appendices
[DE81-026404] N82-13983

COMBUSTION EFFICIENCY
Catalytic combustion of residual fuels
[NASA-TM-82731] N82-13504

COMBUSTION PHYSICS
Gas turbine combustor soot and radiation N82-13174
Cyclic compression, combustion and expansion of a fuel and air mixture in a cylinder containing a catalyst
[PB81-232480] N82-13434

COMBUSTION PRODUCTS
Gas turbine combustor soot and radiation N82-13174
Power-plant fly-ash utilization: A chemical-processing perspective
[DE81-025452] N82-13191
Catalytic combustion of residual fuels
[NASA-TM-82731] N82-13504
High altitude testing of residential wood-fired combustion equipment
[PB81-226151] N82-13575

COMET HEADS
Observational data needs for plasma phenomena N82-13992
New problems of cometary observations from space N82-13994

COMET NUCLEI
Infrared observations of comets N82-14000
On observing comets for nuclear rotation N82-14015
Outburst and nuclear breakup of Comet Halley - 1910 N82-14018

COMET TAILS
Observational data needs for plasma phenomena N82-13992

COMETARY ATMOSPHERES
Spectral imagery: Recent results with the SPIFI and their implications for cometary atmospheric studies --- servocontrolled polarimetric imaging Fabry-Perot interferometer N82-14011
Laboratory measurements of the cometary photochemical phenomena N82-14023

COMETS
Modern Observational Techniques for Comets --- conferences
[NASA-CR-165006] N82-13989
Observing chemical abundances in comets N82-13990
Observational data needs useful for modeling the coma N82-13991
Anticipated results from dust experiments on cometary missions N82-13993
Cometary ephemerides - needs and concerns N82-13995
Introductory remarks: Photometry section N82-13996
Ground-based photometry of comets in the spectral interval 3000 to 3500 angstrom N82-13997
Spectrophotometry of faint comets: The asteroid approach N82-13998
Results to be expected from light scattering dust analyzer during a rendezvous mission N82-13999
Infrared observations of faint comets N82-14001
Radio observations of comets N82-14002
Millimeter wave radiometry as a means of determining cometary surface and subsurface temperature N82-14003
The spectroscopy of comets: Introductory remarks N82-14004
A systematic program of cometary spectroscopy N82-14005
Observing facilities at the European Southern Observatory (ESO) in Chile for cometary observations N82-14006
Ground-based cometary spectroscopy N82-14007
Correlated ground-based and the observations N82-14008
Ultraviolet spectroscopy of comets using sounding rockets, IUE and Spacelab N82-14009
Observations of faint comets at McDonald Observatory: 1978-1980 N82-14010
A possible technique for cometary studies with high angular and spectral resolution N82-14012
The JOCR program --- Joint Observatory for Cometary research N82-14013
Existing cometary data and future needs N82-14017
Laboratory Research --- spectroscopic analysis, photochemical reactions, and proton irradiation of ice N82-14022
Astrometric observations of comets and asteroids and subsequent orbital investigations
[NASA-CR-165004] N82-14039

COMMAND AND CONTROL
Using voice control onboard combat aircraft N82-13056
Voice control of the space shuttle video system N82-13719

COMMERCIAL ENERGY
Ultimate in building energy analysis: DOE-2 and BLAST
[DE81-028703] N82-13263

COMMUNICATING
Linguistic and human performance considerations in the design of an anticipatory communication aid N82-13657

COMMUNICATION NETWORKS
The 30/20 GHz communications satellite trunking network study
[NASA-CR-165467] N82-13302
Fiber optics (optical waveguides) technology: Potential application in the DCS
[AD-A104740] N82-13303
Three-stage commutation field of the system of the repeated use of short-wave receiving antennas N82-13317
The message processing and distribution system development
[AD-A104585] N82-13333

Flow control and routing in an integrated voice and data communication network
[AD-A103342] N82-13337

COMMUNICATION SATELLITES
Technical basis for efficient management of geostationary satellite orbit/spectrum N82-13159
The 30/20 GHz communications satellite trunking network study
[NASA-CR-165467] N82-13302

COMMUNICATION THEORY
Preliminary analysis of a breadth-first parsing algorithm: Theoretical and experimental results
[AD-A101852] N82-13797

COMPARISON
A Bayesian approach to the symmetric multiple comparisons problem in the two-way balanced design N82-13819

COMPARTMENTS
A stochastic extension of the structural properties of compartment models via a Kronecker algebra N82-13810

COMPATIBILITY
Studies of polymer compatibility by nonradiative energy transfer N82-13235

COMPILERS
Digital Equipment Corporation VAX-11 FORTRAN, version 2
[PB81-232431] N82-13745
Digital Equation Corporation PDP-11 COBOL, version 4.1
[PB81-232423] N82-13746
Digital equipment corporation, PDP-11 COBOL version, 4.1 indexed 1-0 module
[PB81-232415] N82-13747
Sperry Univac ASCII COBOL level 5R2
[PB81-228892] N82-13748
COBOL compiler: Northern Telecom, Inc. NTI COBOL/3
[PB81-226417] N82-13749
Compiler generation from lambda calculus definitions of programming languages N82-13759

COMPLEX COMPOUNDS
Molecular beam electric resonance studies of weakly bound complexes N82-13867

COMPLEX SYSTEMS
Descriptive techniques for digital system containing complex hardware components N82-13754

COMPONENT RELIABILITY
Practical aspects of instrumentation system installation, volume 13
[NASA-TM-84067] N82-13140
Passive/hybrid solar components: An approach to standard thermal test methods
[PB81-227886] N82-13549
Fiber optic quality assurance at the Nevada Test Site
[DE81-028740] N82-13890

COMPRESSED AIR
Compressed air energy storage: Preliminary design and site development program in an aquifer. Volume 2: Utility system planning
[DE82-000466] N82-13544

COMPRESSIBLE FLOW
A numerical study of laminar unsteady compressible flow over airfoils N82-13099
Modeling of turbulent mixing at density discontinuities in nonsteady compressible flows
[AD-A105564] N82-13391

COMPRESSION LOADS
Cyclic compression, combustion and expansion of a fuel and air mixture in a cylinder containing a catalyst
[PB81-232480] N82-13434
Measured pavement response to transient aircraft loadings N82-13442
On the buckling force of floating ice plates
[AD-A103733] N82-13472
Electron band theory and high pressure equation of state
[DE81-027436] N82-13955

COMPRESSION TESTS
Effective stress-strain-strength behavior of silicate-grouted sand N82-13257

COMPRESSOR BLADES
The effect of rotor blade thickness and surface finish on the performance of a small axial flow turbine
[NASA-TM-82726] N82-13114

COMPRESSOR EFFICIENCY
Compressor stall inducing installation effects of an engine control parameter for the CF-5 aircraft N82-13085

COMPRESSORS
A device for simulating at a compressor bench an air inlet with large incidence N82-13081

COMPTON EFFECT
Energy spectral analysis in projection radiography N82-13293
Compton scattering in a uniform, constant magnetic field N82-13968

COMPUTATION
Technical evaluation report on the Fluid Dynamics Panel Symposium on Computation of Viscous-Inviscid Interactions
[AGARD-AR-171] N82-13384
Probabilistic error analysis of floating point and CRD arithmetics N82-13758
Solution of single linear tridiagonal systems and vectorization of the ICOG algorithm on the Cray 1 --- laser fusion
[DE81-025461] N82-13773
Feedback plasma control in hybrid poloidal coil system
[IPPJ-542] N82-13905

COMPUTATIONAL FLUID DYNAMICS
Prediction and measurement of time-variant, three-dimensional flows in military aircraft intakes N82-13069
Navier-Stokes solutions for a supersonic coflowing axisymmetric nozzle with a thick annulus N82-13101
Lagrangian fluid dynamics using the Voronoi-Delaunay mesh
[LA-UR-81-1421] N82-13393
A solution of the Navier-Stokes equations by a mixed finite element method
[ONERA-NT-1981-1] N82-13398

COMPUTER COMPONENTS
Descriptive techniques for digital system containing complex hardware components N82-13754

COMPUTER DESIGN
Methods of verification of digital logic N82-13783

COMPUTER GRAPHICS
PLOT2K: A graphics interface of system 2000
[DE81-028706] N82-13774
Increase in the profitability of design and process planning by integrated and graphic data processing, phase 1
[BMFT-FB-W-81-005] N82-13777
Generation of orthogonal and nearly orthogonal boundary-fitted coordinates with direct control of grid spacing
[LOG-J12610] N82-13790
The interactive astronomical data analysis facility - image enhancement techniques to Comet Halley N82-14019

COMPUTER NETWORKS
Flow control and routing in an integrated voice and data communication network
[AD-A103342] N82-13337
Simplified extension of the LSI-11 Q-Bus for a high energy laser control application
[DE81-027001] N82-13424
Beyond mere automation
[AD-A103838] N82-13736
On the formal specification of computer communication protocols
[AD-A100189] N82-13738
Distributed and decentralized control in fully distributed processing systems
[AD-A104379] N82-13739
A difference in efficiency between synchronous and asynchronous systems
[AD-A102280] N82-13742

COMPUTER PROGRAM INTEGRITY
Assessment of the computer code COBRA/CFTL --- for thermal-hydraulic analysis of simulated gas-cooled fast breeder reactor cores
[DE81-027933] N82-13771

COMPUTER PROGRAMMING
Computer science and technology: NBS Programming Environment Workshop report
[PB81-237869] N82-13744
SEPAC software configuration control plan and procedures, revision 1
[NASA-CR-161915] N82-13765
Software design and documentation language: User's guide for SDDL release 4
[NASA-CR-165025] N82-13767
Problems with the multitasking facilities in the ADA programming language
[AD-A105229] N82-13769
Research on knowledge based programming and algorithm design
[AD-A105661] N82-13770
A comparison of three programs for the calculation of surface-ratio
[FOA-C-20392-D8] N82-13779
Parallel scheduling algorithms
[AD-A103796] N82-13820
HETFIS: High-energy nucleon-meson transport code with fission
[DE81-027674] N82-13873

COMPUTER PROGRAMS
Subsonic military aircraft engine intake: An integrated theoretical experiment design N82-13073
Numerical analysis of the scramjet-inlet flow field by using two-dimensional Navier-Stokes equations
[NASA-TP-1940] N82-13142
Ultimate in building energy analysis: DOE-2 and BLAST
[DE81-028703] N82-13263
MAGNA: A finite element program for the materially and geometrically nonlinear analysis of three-dimensional structures subjected to static and transient loading
[AD-A099454] N82-13448
Dynamic analysis of flexible spatial mechanisms and robotic manipulators N82-13460
Proceedings of the 1981 Army Numerical Analysis and Computers Conference
[AD-A103175] N82-13727
Playbk-routines to drive a digital-to-analog converter
[AD-A102049] N82-13741
Computer science and technology: NBS Programming Environment Workshop report
[PB81-237869] N82-13744
Digital Equipment Corporation VAX-11 FORTRAN, version 2
[PB81-232431] N82-13745
Digital Equation Corporation PDP-11 COBOL, version 4.1
[PB81-232423] N82-13746
Digital equipment corporation, PDP-11 COBOL version, 4.1 indexed 1-0 module
[PB81-232415] N82-13747
SEPAC software configuration control plan and procedures, revision 1
[NASA-CR-161915] N82-13765
Software design and documentation language: User's guide for SDDL release 4
[NASA-CR-165025] N82-13767
Assessment of the computer code COBRA/CFTL --- for thermal-hydraulic analysis of simulated gas-cooled fast breeder reactor cores
[DE81-027933] N82-13771
User's manuals for DYNA3D and DYNAP: Nonlinear dynamic analysis of solids in three dimensions
[DE81-028360] N82-13772
Solution of single linear tridiagonal systems and vectorization of the ICOG algorithm on the Cray 1 --- laser fusion
[DE81-025461] N82-13773
PLOT2K: A graphics interface of system 2000
[DE81-028706] N82-13774
MERLIN: A computer program to transfer finite-element meshes
[DE82-000806] N82-13775
Study on the implementation of a program for quality control of computer programs, phase 1 --- European Space Agency
[ESA-CR(P)-1444] N82-13780
Solving multiactivity multifacility capacity-constrained 0-1 assignment problems
[AD-A102583] N82-13796
Computer programs for line shape analysis of X-ray diffraction peaks --- thin film analysis
[PB81-227787] N82-13958
Manual for the program CASLE: Cycle analysis and second-life evaluation
[DE81-027487] N82-13971

COMPUTER STORAGE DEVICES
An approach for numerical database management N82-13731

Capacity and coding for computer memory with defects N82-13750
Direct execution string processor N82-13753

COMPUTER SYSTEMS DESIGN
The SACLANTCEN oceanographic data base. Volume 1: Design criteria and data structure and content
[AD-A103277] N82-13639
System design of the distributed Loop Data Base System (BLDBS) N82-13729
An integrated approach for the specification and the design of the conceptual level in database systems N82-13730
Concurrent testing and checking in computer systems N82-13751
Automated partitioning of hierarchically specified digital systems N82-13752
Direct execution string processor N82-13753
Research on knowledge based programming and algorithm design
[AD-A105661] N82-13770
Design of a real time, interactive, parallel simulation computer N82-13781

COMPUTER SYSTEMS PERFORMANCE
An analytical study of multiprocessor system reliability N82-13728
Concurrent testing and checking in computer systems N82-13751

COMPUTER SYSTEMS PROGRAMS
Use of principle of regularization in direct and mixed problems of the theory of the synthesis of radiating systems N82-13309
An integrated approach for the specification and the design of the conceptual level in database systems N82-13730
Concurrent testing and checking in computer systems N82-13751

COMPUTER SYSTEMS SIMULATION
An analytical study of multiprocessor system reliability N82-13728
An integrated approach for the specification and the design of the conceptual level in database systems N82-13730
Descriptive techniques for digital system containing complex hardware components N82-13754

COMPUTER TECHNIQUES
Computer aided manual tracking N82-13705
Compilation of abstracts of dissertations theses, and research papers submitted by candidates for degrees, 1 October 1979 - 30 September 1980
[AD-A104124] N82-13974

COMPUTER VISION
Symbolic reasoning among 3-D models and 2-D images N82-13761
Computer vision
[NASA-CR-165012] N82-13768

COMPUTERIZED DESIGN
Geometric programming for engineering design optimization N82-13288
Direct digital simulation of power semiconductor-controlled electrical machines N82-13355
Validation, modeling, and computer assisted design program for power converters --- confirmation of dc/dc converters predicted performance
[ESTEC/DERA-8/7208] N82-13370
Statistical energy analysis computer program, user's guide
[NASA-CR-161913] N82-13764
Computer implementation of optimal multivariable controller design in the frequency domain N82-13785

COMPUTERIZED SIMULATION
Subsonic military aircraft engine intake: An integrated theoretical experiment design N82-13073
Satellite attitude control with decomposed controller
[LOG-G668] N82-13160
Titanium response to a nuclear radiation environment
[AD-A102516] N82-13220
Ultimate in building energy analysis: DOE-2 and BLAST
[DE81-028703] N82-13263
Environment simulator for radar signals on the digital level
[FOA-A-30025-E4] N82-13343
Charge-based modeling of capacitance in MOS transistors N82-13350
Direct digital simulation of power semiconductor-controlled electrical machines N82-13355
Application of a gravity-driven wickless heat pipe for ice production in a cold energy storage system N82-13377
Mixing of a passive scalar in isotropic and sheared homogeneous turbulence N82-13405
MAGNA: A finite element program for the materially and geometrically nonlinear analysis of three-dimensional structures subjected to static and transient loading
[AD-A099454] N82-13448
Silicon solar cell optimization
[AD-A106005] N82-13514
Predictor symbology in computer-generated perspective displays N82-13674
Model simulation studies to clarify the effect on saccadic eye movements of initial condition velocities set by the Vestibular Ocular Reflex (VOR) N82-13712
Multi-sensor image registration N82-13755
Assessment of the computer code COBRA/CFTL --- for thermal-hydraulic analysis of simulated gas-cooled fast breeder reactor cores
[DE81-027933] N82-13771
Design of a real time, interactive, parallel simulation computer N82-13781
The reverse-field rigid rotor model, calculation and simulation N82-13898
Observational data needs useful for modeling the coma N82-13991

COMPUTERS
Interruption as a test of the user-computer interface N82-13721
A model for the control mode man-computer interface dialogue N82-13722
Proceedings of the 1981 Army Numerical Analysis and Computers Conference
[AD-A103175] N82-13727
Application of computer voice input/output
[DE81-028769] N82-13743
Probabilistic error analysis of floating point and CRD arithmetics N82-13758

CONCENTRATING
Concentration of organic compounds in water: A literature survey
[DE81-026517] N82-13556

CONCENTRATION
Response of the oceans to increasing atmospheric carbon dioxide
[DE81-028178] N82-13558

CONCRETE STRUCTURES
An experimental study of a reinforced concrete folded plate structure with edge beams N82-13443
Elastic-plastic-fracture analysis of concrete structures N82-13462
Theory and application of experimental model analysis in earthquake engineering N82-13588

CONCRETES
Micromechanics of expansive mechanisms in expansive cement concretes N82-13258
Construction of a recycled Portland cement concrete pavement --- Connecticut expressway
[PB81-233553] N82-13267
Simultaneous heat and mass transfer in a porous medium N82-13404

CONDENSATES
Environmental effects of pollutants from coal combustion. 1: The Four Corners Power Plant, Farmington, N.M.
[PB81-230427] N82-13572
Environmental effects of pollutants from coal combustion. 2: The Colstrip, Montana Power Plant
[PB81-234114] N82-13573

CONDUCTION BANDS
Three laser experiments in gases N82-13416

CONDUCTORS
A hybrid method which combines a moment method current with an asymptotic current
[AD-A102199] N82-13340

CONES
Aerodynamic heating on the corrugated surface of a 10.2 deg half-angle blunted cone at Mach 6.7
[NASA-TP-1928] N82-13383

CONFERENCES
The impact of new guidance and control systems on military aircraft cockpit design
[AGARD-CP-312] N82-13048
Guidelines for line-oriented flight training, volume 2
[NASA-CP-2184-VOL-2] N82-13123
Workshop proceedings: Corrosion of Inconel 600 Steam Generator Tubing in the Tubesheet Crevice
[DE81-903554] N82-13226
Papers presented to the Conference on the Processes of Planetary Rifting
[LPI-CONTRIB-457] N82-13595
Artificial Reefs: Proceedings of a Conference
[PB81-227779] N82-13644
Proceedings of the Seventeenth Annual Conference on Manual Control
[NASA-CR-165005] N82-13665
Proceedings of the 1981 Army Numerical Analysis and Computers Conference
[AD-A103175] N82-13727
Managing information technology change in the decade of the 80's
[AD-A099441] N82-13976

CONFIDENCE LIMITS
Confidence intervals for the reliability of a future system configuration
[AD-A105031] N82-13814

CONFIGURATION INTERACTION
Introduction to the configurable highly parallel computer, revision
[AD-A099776] N82-13735

CONGRESSIONAL REPORTS
Natural gas plan needed to provide greater protection for high-priority and critical uses
[PB81-228488] N82-13255

CONICAL NOZZLES
The subsonic performance of practical military variable area convergent nozzles N82-13076

CONNECTORS
Analysis of steel beam-to-column moment connections N82-13444

CONSECUTIVE EVENTS
Assessing probability assessors: Calibration and refinement
[AD-A104174] N82-13815

CONSERVATION LAWS
A nonlinear conservation law with memory --- history boundary value problems in viscoelastic motion
[AD-A103882] N82-13791

CONSOLES
Development of a miniaturised digital thrust demand unit N82-13055

CONSTANTAN
Pressure measurements of non-planar stress waves --- dual element strain gage
[DE81-028729] N82-13454

CONSTANTS
Determination of optical constants from extinction measurements
[AD-A099494] N82-13882

CONTEXT FREE LANGUAGES
Preliminary analysis of a breadth-first parsing algorithm: Theoretical and experimental results
[AD-A101852] N82-13797

CONTINENTAL SHELVES
Surface waves in strong ground motion with application to offshore environments N82-13584
Environmental assessment of the Alaskan Continental Shelf: Annual reports of principal investigators for the year ending March 1980. Volume 5: Hazards
[PB81-225732] N82-13607

CONTINENTS
Papers presented to the Conference on the Processes of Planetary Rifting
[LPI-CONTRIB-457] N82-13595

CONTINUITY (MATHEMATICS)
The least fixed point property for omega chain continuous functions N82-13787

CONTINUOUS SPECTRA
Ground-based cometary spectroscopy N82-14007

CONTINUOUS WAVE LASERS
CW laser annealing and CW laser assisted diffusion in gallium arsenide N82-13943

CONTINUUM MECHANICS
Nonlinear waves in rods
[AD-A101333] N82-13447
Long-range interactions in lattice field theory N82-13941

CONTRACTION
Thermal contraction and flexure of intracratonic basins: A three dimensional study of the Michigan Basin N82-13582

CONTROL
A model for the control mode man-computer interface dialogue N82-13722
CONTROL BOARDS
Tanker avionics and aircrew complement evaluation N82-13063
F/A 18 Hornet crew station N82-13064
CONTROL EQUIPMENT
The impact of new guidance and control systems on military aircraft cockpit design [AGARD-CP-312] N82-13048
Integration of controls and displays in US Army helicopter cockpits N82-13053
A standard control display unit for multi-aircraft application N82-13054
Development of a miniaturised digital thrust demand unit N82-13055
Sensor failure detection system --- for the F100 turbofan engine [NASA-CR-165515] N82-13145
Shape determination and control for large space structures [JPL-PUB-81-71] N82-13166
FOA 27 control instruments data system. Control instruments and their functions [FOA-C-20394-D3] N82-13410
Controlled Speed Accessory Drive demonstration program [NASA-CR-165010] N82-13981
CONTROL SIMULATION
Man/machine interface development for the REMOTEX concept N82-13678
Identification of multiloop pilot describing functions obtained from simulated approaches to an aircraft carrier N82-13686
Feedback plasma control in hybrid poloidal coil system [IPPJ-542] N82-13905
CONTROL STABILITY
Stability analysis of automobile driver steering control N82-13717
CONTROL SURFACES
Force and moment, flow-visualization, and boundary-layer tests on a shuttle orbiter model at Mach 6 [NASA-TP-1952] N82-13106
Pressure distributions on three different cruciform aft-tail control surfaces of a wingless missile at Mach 1.60, 2.36, and 3.70. Volume 1: Trapezoidal tail [NASA-TM-80097] N82-13110
CONTROL THEORY
Satellite attitude control with decomposed controller [LOG-G668] N82-13160
Distributed and decentralized control in fully distributed processing systems [AD-A104379] N82-13739
CONTROL UNITS (COMPUTERS)
Application of computer voice input/output [DE81-028769] N82-13743
CONTROLLABILITY
Evaluation of a pilot workload assessment device to test alternate display formats and control handling qualities N82-13062
Limited evaluation of an F-14A airplane utilizing an aileron-rudder interconnect control system in the landing configuration [NASA-TM-81972] N82-13148
On the use of the OCM's quadratic objective function as a pilot rating metric N82-13693
CONTROLLED FUSION
Gas target neutron generator studies [UTIAS-251] N82-13850
CONTROLLERS
Control design for parameter sensitivity reduction in linear regulators: Application to large flexible space structures N82-13158
Simplified extension of the LSI-11 Q-Bus for a high energy laser control application [DE81-027001] N82-13424
A data collection scheme for identification of parameters in a driver model N82-13696
Playbk-routines to drive a digital-to-analog converter [AD-A102049] N82-13741
Computer implementation of optimal multivariable controller design in the frequency domain N82-13785
CONVERGENCE
Strong convergence of nearest neighbor regression estimators [AD-A104479] N82-13794
CONVERGENT NOZZLES
The subsonic performance of practical military variable area convergent nozzles N82-13076
Comparison of different nozzle concepts for a reheated turbofan N82-13077
Investigation of acoustic interactions in jet thrust augmenting ejectors [AD-A106083] N82-13835
CONVERGENT-DIVERGENT NOZZLES
Comparison of different nozzle concepts for a reheated turbofan N82-13077
CONVOLUTION INTEGRALS
Comparison of data inversion techniques for remotely sensed wide-angle observations of Earth emitted radiation [NASA-TP-1924] N82-13620
Evaluation of HALO deconvolution schemes [AD-A105125] N82-13878
COOLING
Electric coheating experiment to determine the heat-loss coefficient of a double-envelope house [DE81-027937] N82-13264
Thermal contraction and flexure of intracratonic basins: A three dimensional study of the Michigan Basin N82-13582
COORDINATES
Three-dimensional mapping of the aurora from digitized all-sky pictures [REPT-550.388.8] N82-13591
MERLIN: A computer program to transfer finite-element meshes [DE82-000806] N82-13775
Curvature singularities in certain space-times N82-13824
COORDINATION POLYMERS
Studies of polymer compatibility by nonradiative energy transfer N82-13235
COPOLYMERS
Structure-property relationships in segmented elastomers: Small angle X-ray scattering, thermal, and mechanical studies N82-13240
COPPER
Acoustic nondestructive evaluation of microstructure --- pure copper and plain carbon and low alloy steels N82-13211
The trace metal stratigraphy and recent sedimentary history of anthrogenous particulates on the San Pedro Shelf, California N82-13579
CORE SAMPLING
A depositional model for major coal seams in the Rock Springs Formation, Upper Cretaceous, southwest Wyoming N82-13580
Acoustical properties of sediments [AD-A103726] N82-13638
CORRELATION
Proving total correctness of nondeterministic programs in infinitary logic [MC-IW-150/80] N82-13799
Correlated ground-based and the observations N82-14008
CORRELATION COEFFICIENTS
Analysis of soil moisture extraction algorithm using data from aircraft experiments [NASA-CR-166719] N82-13470
CORROSION
Mathematical model of differential reflectometry for use in the investigation of thin film corrosion products N82-13232
Development of the high-temperature redox electrode and improved corrosion rate meter [DE82-000933] N82-13409
Aging and corrosion problems with flat solar energy absorbers. Study based upon literature and experiment exchanges [SP-RAPP-1979/4] N82-13548
Update on Specified European R and D Efforts. Part 1: Appendices [DE81-026404] N82-13983
CORROSION PREVENTION
Workshop proceedings: Corrosion of Inconel 600 Steam Generator Tubing in the Tubesheet Crevice [DE81-903554] N82-13226
Development of the high-temperature redox electrode and improved corrosion rate meter [DE82-000933] N82-13409
CORROSION RESISTANCE
Workshop proceedings: Corrosion of Inconel 600 Steam Generator Tubing in the Tubesheet Crevice [DE81-903554] N82-13226
CORROSION TESTS
An improved stress corrosion test medium for aluminum alloys [NASA-TM-82452] N82-13216
CORRUGATED PLATES
Aerodynamic heating on the corrugated surface of a 10.2 deg half-angle blunted cone at Mach 6.7 [NASA-TP-1928] N82-13383
Study of corrugated plates N82-13426
COST ESTIMATES
A new approach to modeling the cost of ownership for aircraft systems [AD-A104434] N82-13979
COUNTER ROTATION
The reverse-field rigid rotor model, calculation and simulation N82-13898
COUNTERMEASURES
Camelot: A novel concept for a multiterawatt pulse power generator for single pulse burst or repetition rate operation [AD-A103024] N82-13513
COUPLED MODES
Studies of sample introduction for inductively coupled plasma emission spectrometry N82-13209
CRACK INITIATION
Fatigue crack initiation and electrochemical behavior of 403 stainless steel in aqueous environments N82-13210
Cyclic deformation and fatigue crack initiation of a coherently precipitating Ni-14.4 at % Al alloy N82-13212
Cyclic deformation and fatigue microcrack initiation in pearlitic eutectoid steel N82-13230
Methods of obtaining crack growth data in metals N82-13283
CRACK PROPAGATION
Fatigue crack propagation studies in two cryogenic steels N82-13213
Methods of obtaining crack growth data in metals N82-13283
Monitoring of damage in fibre composites N82-13284
Cyclic strain approach to fatigue in metals N82-13285
Dynamic effects on fracture of elastic - plastic materials N82-13463
Workshop proceedings: U-bend tube cracking in steam generators [DE81-903765] N82-13515
Evaluation of creep-fatigue life-prediction models for the solar central receiver [DE82-000942] N82-13529
CRACKING (FRACTURING)
Fatigue Test Methodology [AGARD-LS-118] N82-13274
CRACKS
Workshop proceedings: Corrosion of Inconel 600 Steam Generator Tubing in the Tubesheet Crevice [DE81-903554] N82-13226
CREEP ANALYSIS
Analysis of stress drop in multistage creep experiments: Predictions of exponential creep law [DE81-029279] N82-13453
CREEP PROPERTIES
Creep and creep rupture of laminated graphite/epoxy composites N82-13173
CROP INVENTORIES
Structure of the knowledge base for an expert labeling system N82-13723
CROSS FLOW
Crossflow effects on steady and fluctuating pressures on an ogive-cylinder cone-frustum model in supersonic separated flow [NASA-TP-1951] N82-13108
CRUSTAL FRACTURES
Studies of natural fractures, fault zone permeability, and a pore space-permeability model N82-13616
Two detailed seismic studies in Central California. Part 1: Earthquake clustering and crustal structure studies of the San Andrea fault near San Juan Bautista. Part 2: Seismic velocity structure along the Sierra foothills near Oroville, California N82-13617
CRYOGENIC COOLING
Cryogenic testing of 100-m superconducting power transmission test facility [DE81-028331] N82-13517

CRYOGENIC MAGNETS
Materials studies for magnetic fusion energy applications at low temperatures -4
[PB81-222507] N82-13928
CRYSTAL DEFECTS
Defect structure and properties of intermetallic compound beta-LiAl N82-13959
CRYSTAL DISLOCATIONS
Push-pull fatigue of LiF and MgO single crystals N82-13960
The structure and properties of grain boundaries N82-13962
CRYSTAL GROWTH
Large area sheet task: Advanced dendritic web growth development
[NASA-CR-165013] N82-13497
Continuous Czochralski growth: Silicon sheet growth development of the large area sheet task of the low cost silicon solar array project
[NASA-CR-165030] N82-13500
Development of high-efficiency cascade solar cells
[DE81-029633] N82-13540
Fluorescent guest-host effect in scattering liquid crystals and new physical phenomena in thin liquid crystal films N82-13940
CRYSTAL LATTICES
Physical adsorption of quantum atomic and molecular systems N82-13846
Role of molecular dynamics on descriptions of shock front processes
[DE81-028687] N82-13857
Long-range interactions in lattice field theory N82-13941
CRYSTAL STRUCTURE
Potential use of the minicomputer controlled powder diffractometer for the structure determination of small quantities of rather impure materials N82-13207
The structural and vibrational properties of amorphous and crystalline group V elements N82-13933
Defect studies of molecular and rare-gas crystals down to 50mK and up to 150 MPa
[DE81-026617] N82-13949
CRYSTALLIZATION
Strain-induced crystallization of polymers N82-13239
Large area sheet task: Advanced dendritic web growth development
[NASA-CR-165013] N82-13497
CRYSTALLOGRAPHY
Petrology and geochemistry of ophiolite fragments in a tectonic melange, Kodiak Islands, Alaska N82-13610
Spectrometric properties of crystals for low-energy X-ray diagnostics
[DE81-028763] N82-13954
CRYSTALS
The structural and vibrational properties of amorphous and crystalline group V elements N82-13933
Spectrometric properties of crystals for low-energy X-ray diagnostics
[DE81-028763] N82-13954
CUMULATIVE DAMAGE
Positron lifetime and Doppler broadening techniques applied to irradiation damaged silver
[DE81-028688] N82-13854
CURING
Investigation of test methods, material properties, and processes for solar cell encapsulants
[NASA-CR-165031] N82-13503
CURRENT DENSITY
Soft and hard major disruptions in the profile control experiment of the JIPP T-2 Tokamak
[IPPJ-547] N82-13902
CURRENT DISTRIBUTION
A hybrid method which combines a moment method current with an asymptotic current
[AD-A102199] N82-13340
CURRENT REGULATORS
Distributed photovoltaic systems: Utility interface issues and their present status
[NASA-CR-165019] N82-13492
CURVATURE
Curvature singularities in certain space-times N82-13824
CURVE FITTING
Weighting of aptitude components based on differences in technical school difficulty
[AD-A102045] N82-13725
CYANO COMPOUNDS
Review of low-voltage CP detonators
[DE81-025837] N82-13250
Performance of chemical analogs of the explosive CP
[DE81-025836] N82-13251
CYBERNETICS
A model for the control mode man-computer interface dialogue N82-13722
CYCLES
The nitrogen cycle and heat budget of a subtropical lagoon, Devils Hole, Harrington Sound, Bermuda: Implications for nitrous oxide production and consumption in marine environments N82-13611
CYCLIC HYDROCARBONS
Solubilities in multicomponent systems of nonspecific interactions N82-13205
CYCLIC LOADS
Cyclic deformation and fatigue microcrack initiation in pearlitic eutectoid steel N82-13230
CYCLONES
Some mean characteristics of Central North Pacific tropical cyclones
[PB81-230492] N82-13634
Annual data and verification tabulation, eastern North Pacific tropical storms and hurricanes 1980
[PB81-230336] N82-13636
CYCLOTRON FREQUENCY
Electromagnetic cyclotron harmonic waves --- plasma heating
[IPPJ-536] N82-13903
CYCLOTRON RADIATION
Electromagnetic cyclotron harmonic waves --- plasma heating
[IPPJ-536] N82-13903
CYCLOTRON RESONANCE
Ion cyclotron resonance heating and its effect on confinement in Tokamaks N82-13896
CYLINDRICAL ANTENNAS
The formation of radiation patterns of arc antennas N82-13305
Thin magnetic impedance antennas N82-13314
Natural and mutual conductivities of half-wave slots, arbitrarily oriented on the conducting surface of circular cylinder --- slot antennas N82-13331
CYLINDRICAL BODIES
Crossflow effects on steady and fluctuating pressures on an ogive-cylinder cone-frustum model in supersonic separated flow
[NASA-TP-1951] N82-13108

D

DARK ADAPTATION
Pupillometry, a bioengineering overview N82-13711
DATA ACQUISITION
An acquisition and analysis system for dynamic tests of air inlets N82-13082
Optical scanner system for internal inspection of steam-generator tubes
[EPRI-NP-1944] N82-13884
Data management in a fusion energy research experiment
[DE81-027932] N82-13978
DATA BASE MANAGEMENT SYSTEMS
The SACLANTCEN oceanographic data base. Volume 1: Design criteria and data structure and content
[AD-A103277] N82-13639
An integrated approach for the specification and the design of the conceptual level in database systems N82-13730
An approach for numerical database management N82-13731
Survey of standards applicable to a database management system
[NASA-CR-165009] N82-13766
PLOT2K: A graphics interface of system 2000
[DE81-028706] N82-13774
Data management in a fusion energy research experiment
[DE81-027932] N82-13978
DATA BASES
International seismological data center. Input data for an experimental data base
[FOA-C-20380-T1] N82-13604
An integrated approach for the specification and the design of the conceptual level in database systems N82-13730
A specification and proof technique for message-based systems and its application to distributed database algorithms N82-13756
Query optimization by semantic reasoning N82-13762
Separations Science data base: An abstractor's manual
[DE81-029101] N82-13977
Astronomical data bases and retrieval systems N82-14020
DATA COMPRESSION
Digital video bandwidth compression systems employing block truncation coding N82-13290
Digital data compression algorithm performance comparisions: Proposed NATO standard algorithm provides better facsimile in a noisy communications environment than present Tactical Digital Facsimile algorithm
[AD-A103159] N82-13737
Trellis data compression N82-13784
DATA CONVERSION ROUTINES
Simple geometric algorithms to aid in clearance management for robotic mechanisms N82-13680
Playbk-routines to drive a digital-to-analog converter
[AD-A102049] N82-13741
DATA CORRELATION
Weighting of aptitude components based on differences in technical school difficulty
[AD-A102045] N82-13725
DATA PROCESSING
Direct execution string processor N82-13753
Increase in the profitability of design and process planning by integrated and graphic data processing, phase 1
[BMFT-FB-W-81-005] N82-13777
Measurement of sound absorption in the air --- data procesing N82-13829
Managing information technology change in the decade of the 80's
[AD-A099441] N82-13976
Data management in a fusion energy research experiment
[DE81-027932] N82-13978
DATA PROCESSING EQUIPMENT
An analytical study of multiprocessor system reliability N82-13728
PLOT2K: A graphics interface of system 2000
[DE81-028708] N82-13774
The interactive astronomical data analysis facility - image enhancement techniques to Comet Halley N82-14019
DATA RECORDERS
On-board data recorder for hard-target weapons
[DE81-028645] N82-13408
DATA REDUCTION
Comparison of data inversion techniques for remotely sensed wide-angle observations of Earth emitted radiation
[NASA-TP-1924] N82-13620
DATA STORAGE
An approach for numerical database management N82-13731
Information storage in a decentralized computer system N82-13732
DATA SYSTEMS
FOA 27 control instruments data system. Control instruments and their functions
[FOA-C-20394-D3] N82-13410
DATA TRANSMISSION
Joint agency Doppler technology tests
[AD-A100208] N82-13335
Time dependent recording of images transmitted over optical fibers
[DE81-026599] N82-13889
DECAY RATES
The hadronic decay rate of the Higgs boson: An application of the running mass N82-13842
DECISION MAKING
The intelligent use of intelligent systems: Problems in engineering man/machine symbiosis N82-13058
Building a consensus about energy technologies
[DE82-000501] N82-13536
Identification of cognitive factors related to remote work performance using closed circuit TV displays N82-13679

Decision aids for airborne intercept operations in advanced aircrafts N82-13683
A model of the human observer and decision maker N82-13714
Dynamic decision-making in multi-task environments: Theory and experimental results [AD-A102055] N82-13740
Calibration of probabilities: The state of the art to 1980 [AD-A101986] N82-13817

DECISION THEORY
Synthesis of a plane system of discrete emitters N82-13310
Assessing probability assessors: Calibration and refinement [AD-A104174] N82-13815

DECODERS
Capacity and coding for computer memory with defects N82-13750
Trellis data compression N82-13784

DECODING
Trellis data compression N82-13784

DEFECTS
Defect structure and properties of intermetallic compound beta-LiAl N82-13959

DEFLECTION
Measured pavement response to transient aircraft loadings N82-13442

DEFLECTORS
Transonic flows in an air inlet with large incidence and the effect of a blowing trap N82-13071

DEFORMATION
Measured pavement response to transient aircraft loadings N82-13442

DEGREES OF FREEDOM
A mixed variational principle for finite element analysis N82-13789

DELAMINATING
Creep and creep rupture of laminated graphite/epoxy composites N82-13173

DELTA WINGS
Force measurements on a reflex cambered delta wing [LOG-C4073] N82-13111

DELTAS
A depositional model for major coal seams in the Rock Springs Formation, Upper Cretaceous, southwest Wyoming N82-13580

DEMODULATION
Modulation/demodulation techniques for satellite communications. Part 1: Background [NASA-CR-165020] N82-13301

DEMULTIPLEXING
Time dependent recording of images transmitted over optical fibers [DE81-026599] N82-13889

DENDRITIC CRYSTALS
Large area sheet task: Advanced dendritic web growth development [NASA-CR-165013] N82-13497

DENSE PLASMAS
Electromagnetic cyclotron harmonic waves --- plasma heating [IPPJ-536] N82-13903
Plasma focus breeder [IPPJ-541] N82-13904

DENSITY (MASS/VOLUME)
Review of low-voltage CP detonators [DE81-025837] N82-13250

DEPENDENCE
Radiatively cooled stellar winds N82-14034

DEPOSITION
Field tests of a surface ice accretion measurement system [AD-A100282] N82-13624
Deposition of aerosol particles in the human respiratory tract N82-13659

DEPTH
A model for the submarine depthkeeping team N82-13689

DERIVATION
Zeros of successive derivatives of some entire functions of infinite order N82-13788
On the dependence of the growth of an entire function of the distribution of the zeros of its derivatives and a conjecture of G. Polya N82-13805

DESALINIZATION
Salt removal from brackish water by continuous processes with amphoteric, thermally regenerable ion-exchange resins N82-13202

DESCRIPTIVE GEOMETRY
Geometric programming for engineering design optimization N82-13288

DESIGN ANALYSIS
A numerical investigation of exhaust plume temperature effects on nonaxisymmetric nozzle/afterbody performance N82-13079
Establishment of an experimental technique to provide accurate measurement of the installed drag of close coupled civil nacelle/airframe configurations, using a full span model with turbine powered engine simulators N82-13089
Parametric study of silo-material interaction N82-13259
Load and resistance factor design of cold-formed steel structural members N82-13464
Information and display requirements for aircraft terrain following N82-13695
Beyond mere automation [AD-A103838] N82-13736
Methods of verification of digital logic N82-13783
Transition radiation as an X-ray source N82-13840
Optics of mass separator 1 [DE81-028242] N82-13886

DESIGN TO COST
Control design for parameter sensitivity reduction in linear regulators: Application to large flexible space structures N82-13158

DESORPTION
Electric field-enhanced diffusion and electron stimulated desorption of alkali elements from glass surfaces during electron bombardment and Auger electron analysis N82-13961

DESTRUCTIVE TESTS
Testing of a work bench for handling of explosives in the laboratory [FOA-C-20393-D1] N82-13397

DETECTION
Sensor failure detection system --- for the F100 turbofan engine [NASA-CR-165515] N82-13145
Analytical detection of organic species by means of laser-induced multiphoton ionization N82-13646

DETONATION
Explosive-metal composites and electrical switch technology [AD-A099476] N82-13361

DETONATORS
Review of low-voltage CP detonators [DE81-025837] N82-13250
Performance of chemical analogs of the explosive CP [DE81-025836] N82-13251

DIAGNOSIS
The relationship between the number of factors and size of an experiment --- a medical diagnostics case [AD-A103877] N82-13792

DIAMAGNETISM
Driving force of the ballooning instability [DE81-023099] N82-13923

DICHROISM
Relativistic many-body perturbation theory of parity-violation in atoms N82-13845

DIELECTRIC PROPERTIES
Antenna (selected articles) [AD-A106499] N82-13323
Directed dividers on the metal-dielectric waveguides N82-13326
DC dielectric strengths of fluorinated benzenes and the stored-energy theory [DE81-026515] N82-13516

DIELECTRICS
Studies of photoionization in liquids using a laser two-photon ionization conductivity technique [DE81-026514] N82-13194
One use of methods of the statistical theory of antennas N82-13325
Some experiences with the use of castor oil as a dielectric [AD-A102348] N82-13363
Role of electron swarm studies in the development of gaseous dielectrics [DE81-026349] N82-13952

DIESEL ENGINES
Examination of early wear detection in diesel engines by energy dispersive radioisotope X ray fluorescence analysis [BMVG-FBWT-79-19] N82-13432
Alternate hybrid power sources for remote site applications [AD-A099471] N82-13512

DIFFERENTIAL EQUATIONS
A sharper estimate of the renewal function [CTH-MATH-1980-18] N82-13798
Pointwise error estimation for finite element discretizations, part 1 [TRITA-NA-8105-PT-1] N82-13801
On the relationship between analytical regularization and regularization by surgery N82-13823

DIFFERENTIAL GEOMETRY
Ultraviolet structure of supersymmetric non-linear sigma-models N82-13843

DIFFERENTIAL PULSE CODE MODULATION
Application of electrochemistry to biochemical problems --- immunoassay technique using differential pulse anodic stripping voltammetry N82-13179

DIFFRACTION PATTERNS
High frequency scattering from multiple finite elliptic cylinders N82-13291
Low energy X-ray spectrometer [DE81-025824] N82-13407

DIFFRACTOMETERS
Potential use of the minicomputer controlled powder diffractometer for the structure determination of small quantities of rather impure materials N82-13207

DIFFUSION
A monitor for noninvasive estimation of pulmonary blood flow N82-13656
Helium diffusion in irradiated boron carbide [DE81-027848] N82-13951

DIGITAL COMPUTERS
Development report: Automatic System Test and Calibration (ASTAC) equipment [NASA-CR-165403] N82-13505

DIGITAL DATA
Time dependent recording of images transmitted over optical fibers [DE81-026599] N82-13889

DIGITAL FILTERS
Topics in digital signal processing N82-13346
Superconducting magnetometry for cardiovascular studies and an application of adaptive filtering N82-13648

DIGITAL INTEGRATORS
Techniques for interfacing multiplex systems [AD-A101457] N82-13135

DIGITAL SIMULATION
A real time Pegasus propulsion system model for VSTOL piloted simulation evaluation [NASA-TM-82770] N82-13144
An integrated approach for the specification and the design of the conceptual level in database systems N82-13730

DIGITAL SYSTEMS
How the helicopter cockpit designer uses digital avionics N82-13049
Development of a miniaturised digital thrust demand unit N82-13055
Modulation/demodulation techniques for satellite communications. Part 1: Background [NASA-CR-165020] N82-13301
Automated partitioning of hierarchically specified digital systems N82-13752
Descriptive techniques for digital system containing complex hardware components N82-13754
Measurement of sound absorption in the air --- data procesing N82-13829
Far infrared source classification system --- digital system [ENST-E-80005] N82-13891

DIGITAL TECHNIQUES
Command-response data transmision to mechanical systems management effect on the crew/system interface N82-13057
JASPIC-DIP: The digital impedance probe in the JASPIC project [BMFT-FB-W-80-034] N82-13169
Three-dimensional mapping of the aurora from digitized all-sky pictures [REPT-550.388.8] N82-13591
The interactive astronomical data analysis facility - image enhancement techniques to Comet Halley N82-14019

DIGITAL TO ANALOG CONVERTERS
Playbk-routines to drive a digital-to-analog converter [AD-A102049] N82-13741

DIRAC EQUATION
Pattern of neutrino mixing in grand unified theories [DE81-029034] N82-13872
Compton scattering in a uniform, constant magnetic field N82-13968
DIRECT CURRENT
Fundamental studies of direct current plasmas N82-13895
Nonlinear optical effects in liquid crystals N82-13937
DIRECT POWER GENERATORS
Develop and test fuel cell powered on-site integrated total energy system. Phase 3: Full-scale power plant development [NASA-CR-165328] N82-13490
DIRECTIONAL ANTENNAS
Antenna (selected articles) [AD-B060573] N82-13318
Discrimination of hologram and antenna theory N82-13320
DIRECTORS (ANTENNA ELEMENTS)
Nonlinear waves in rods [AD-A101333] N82-13447
DISCHARGE COEFFICIENT
Hydrodynamic computations of pressures generated by steam pipe rupture [AD-A102046] N82-13449
Stability considerations for light-ion beam transport in Z discharge channels [AD-A101426] N82-13852
DISCONTINUITY
Rayleigh-Taylor stability for a shock wave-density discontinuity interaction [DE81-028707] N82-13394
DISCRETE FUNCTIONS
Simulation studies on the computation of the gravity vector in space from surface data considering the topography of the Earth N82-13612
On general 1 exp p summability methods [CTH-MATH-1981-07] N82-13803
DISPLAY DEVICES
The impact of new guidance and control systems on military aircraft cockpit design [AGARD-CP-312] N82-13048
Electronic flight deck displays for military transport aircraft N82-13050
Color CRT displays for the cockpit N82-13051
Integration of controls and displays in US Army helicopter cockpits N82-13053
A standard control display unit for multi-aircraft application N82-13054
Evaluation of a pilot workload assessment device to test alternate display formats and control handling qualities N82-13062
Tanker avionics and aircrew complement evaluation N82-13063
F/A 18 Hornet crew station N82-13064
Electronic master monitor and advisory display system test and demonstration report [AD-A105317] N82-13141
Proceedings of the Seventeenth Annual Conference on Manual Control [NASA-CR-165005] N82-13665
Horizontal conflict resolution maneuvers with a cockpit display of traffic information N82-13671
Predictor symbology in computer-generated perspective displays N82-13674
Modeling of the aircraft in-trail-following task during profile descent N82-13690
Functional structure and dynamics of the human nervous system N82-13692
Information and display requirements for aircraft terrain following N82-13695
Pilot scanning patterns while viewing cockpit displays of traffic information N82-13710
Multifunctions - liquid crystal displays [BMFT-FB-T-80-181] N82-13957
DISSOCIATION
Role of molecular dynamics on descriptions of shock front processes [DE81-028687] N82-13857
DISSOLVED GASES
Solubilities of dissolved gases in sea water [AD-A100675] N82-13189
DISTILLATION
Synthetic fuel aromaticity and staged combustion [DE81-024205] N82-13246
DISTORTION
A synthesis method for estimating maximum instantaneous inlet distortion based on measured inlet steady state and RMS pressures N82-13083
One use of methods of the statistical theory of antennas N82-13325
Impacts of vertical scale distortion on turbulent mixing in hydraulic models N82-13382
DISTRIBUTED PARAMETER SYSTEMS
System design of the distributed Loop Data Base System (BLDBS) N82-13729
Distributed and decentralized control in fully distributed processing systems [AD-A104379] N82-13739
DISTRIBUTING
Solving multiactivity multifacility capacity-constrained 0-1 assignment problems [AD-A102583] N82-13796
DISTRIBUTION MOMENTS
Some mean characteristics of Central North Pacific tropical cyclones [PB81-230492] N82-13634
DISTRICT OF COLUMBIA
The District of Columbia Five-Year Water Resources Research Program Plan, 1982-1987 [PB81-234882] N82-13482
DIVERTERS
Subsonic military aircraft engine intake: An integrated theoretical experiment design N82-13073
DOORS
Subsonic military aircraft engine intake: An integrated theoretical experiment design N82-13073
DOPED CRYSTALS
Charge trapping in interface doped MNOS structures N82-13930
The growth and carrier transport properties of sputter deposited GaAs thin films doped with silicon and magnesium N82-13965
DOPPLER EFFECT
Report of survey for McDonald Observatory, Harvard Radio Astronomy Station, and vicinity [PB81-234338] N82-13606
Positron lifetime and Doppler broadening techniques applied to irradiation damaged silver [DE81-028688] N82-13854
DOPPLER RADAR
Joint agency Doppler technology tests [AD-A100208] N82-13335
Feasibility study of a procedure to detect and warn of low level wind shear [NASA-CR-3480] N82-13621
Spring program summary, 1980 [PB81-234940] N82-13628
DOSIMETERS
Requirements for an effective National Nonionizing Radiation Measurement System [PB81-223455] N82-13414
Specific gamma-ray dose constants for nuclides important to dosimetry and radiological assessment [DE81-031980] N82-13863
DRAG
Energetics and dynamics of droplet evaporation in high temperature intermediate Reynolds number flows N82-13379
DRAG MEASUREMENT
Model testing techniques for measuring inlet drag N82-13084
DRAG REDUCTION
An experimental study of Tollmien-Schlichting wave cancellation --- friction drag reduction N82-13120
DRAINAGE
An initial study of the application of the numerical method of characteristics to unsteady flow analysis in partially filled gravity drainage sized pipes [PB81-229189] N82-13399
DRAINAGE PATTERNS
Alaska's Water resources problems and research needs: Institute of Water Resources, five-year research plan [PB81-231920] N82-13477
DRIFT RATE
Two-satellite study of proton drift on quiet days [AD-A104736] N82-13601
DRILL BITS
Preliminary evaluation of ion implantation as a surface treatment to reduce wear of tool bits [AD-A105053] N82-13261
DRILLING
Control of methane by ventilation of shafts during raise drilling [PB81-234502] N82-13487
DROPS (LIQUIDS)
Energetics and dynamics of droplet evaporation in high temperature intermediate Reynolds number flows N82-13379
Experimental determination of the effect of physical properties on the drag of liquid drops N82-13380
Numerical experiments on two-phase liquid-vapor mist transport N82-13402
DRUGS
Manual control analysis of drug effects on driving performance N82-13709
DRYING APPARATUS
Appliance efficiency and the solar building [DE81-029073] N82-13265
Some experiences with the use of castor oil as a dielectric [AD-A102348] N82-13363
DUCT GEOMETRY
Effects of intake geometry on circular pitot intake performance at zero and low forward speeds N82-13070
Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-field [NASA-TM-82750] N82-13908
DUCTED FLOW
Computational methods for internal flows with emphasis on turbomachinery [NASA-TM-82764] N82-13113
DUCTILITY
Mechanisms by which humidity alters ductility [AD-A105530] N82-13221
DUST
Three Bureau of Mines optical dust probes [PB81-231441] N82-13412
Suppression of coal dust explosion by water barrier in a conveyor belt entry [PB81-233306] N82-13489
Anticipated results from dust experiments on cometary missions N82-13993
Results to be expected from light scattering dust analyzer during a rendezvous mission N82-13999
Infrared observations of comets N82-14000
Infrared observations of faint comets N82-14001
DUST COLLECTORS
High-pressure shrouded water sprays for dust control [PB81-231458] N82-13483
DYE LASERS
Investigation of fluctuation phenomena in dye lasers N82-13419
DYES
Spectroelectrochemistry, flash photolysis and photogalvanic effect of methylene blue and safranin-0 N82-13208
DYNAMIC CHARACTERISTICS
A study of the dynamic and transient properties of polymer solutions N82-13241
Determination of efficient methods of lift by comparing trained and untrained male and female lifters [AD-A100349] N82-13650
Role of molecular dynamics on descriptions of shock front processes [DE81-028687] N82-13857
DYNAMIC LOADS
Measured pavement response to transient aircraft loadings N82-13442
DYNAMIC MODELS
Shape determination and control for large space structures [JPL-PUB-81-71] N82-13166
Theory and application of experimental model analysis in earthquake engineering N82-13588
Benefits of detailed models of muscle activation and mechanics N82-13713
A model of the human observer and decision maker N82-13714
DYNAMIC RESPONSE
Effects of hygrothermal conditioning on the dynamic behavior of resin matrix composites N82-13172
Titanium response to a nuclear radiation environment [AD-A102516] N82-13220
Dynamic effects on fracture of elastic - plastic materials N82-13463

Surface waves in strong ground motion with application to offshore environments N82-13584
Dynamic measurement of human vertical fusional response N82-13660

DYNAMIC STRUCTURAL ANALYSIS
MAGNA: A finite element program for the materially and geometrically nonlinear analysis of three-dimensional structures subjected to static and transient loading
[AD-A099454] N82-13448
Structural dynamics: Modified calculations --- natural and harmonically excited vibrations of modified structures; increased computation efficiency
[BMVG-FBWT-81-1] N82-13457
Dynamic analysis of flexible spatial mechanisms and robotic manipulators N82-13460
User's manuals for DYNA3D and DYNAP: Nonlinear dynamic analysis of solids in three dimensions
[DE81-028360] N82-13772

DYNAMIC TESTS
An acquisition and analysis system for dynamic tests of air inlets N82-13082

E

EARTH ATMOSPHERE
Aircraft data summaries for the SURE intensives, volume 1
[DE82-900314] N82-13568
Propagation of sound through the Earth's atmosphere
[NASA-CR-165008] N82-13828

EARTH CORE
The crustal structure of Kilauea and Mauna Loa volcanoes, Hawaii, from seismic refraction and gravity data N82-13583

EARTH CRUST
Thermal contraction and flexure of intracratonic basins: A three dimensional study of the Michigan Basin N82-13582
The crustal structure of Kilauea and Mauna Loa volcanoes, Hawaii, from seismic refraction and gravity data N82-13583
Surface waves in strong ground motion with application to offshore environments N82-13584
Studies of natural fractures, fault zone permeability, and a pore space-permeability model N82-13616

EARTH MANTLE
The crustal structure of Kilauea and Mauna Loa volcanoes, Hawaii, from seismic refraction and gravity data N82-13583

EARTH MOVEMENTS
Surface waves in strong ground motion with application to offshore environments N82-13584

EARTH PLANETARY STRUCTURE
Papers presented to the Conference on the Processes of Planetary Rifting
[LPI-CONTRIB-457] N82-13595
Basement rocks of the main interior basins of the midcontinent
[NASA-CR-164935] N82-13596

EARTH RESOURCES
Creating a safer environment in US coal mines: The Bureau of Mines Methane Control Program, 1964-79
[PB81-233918] N82-13488

EARTH SURFACE
Interpolating for the location of remote sensor data
[NASA-TM-82169] N82-13469
Simulation studies on the computation of the gravity vector in space from surface data considering the topography of the Earth N82-13612
Field tests of a surface ice accretion measurement system
[AD-A100282] N82-13624

EARTHQUAKE RESISTANT STRUCTURES
Theory and application of experimental model analysis in earthquake engineering N82-13588

EARTHQUAKES
Recurrence intervals and recency of faulting along the San Gregorio fault zone, San Mateo County, California N82-13581
Two detailed seismic studies in Central California. Part 1: Earthquake clustering and crustal structure studies of the San Andrea fault near San Juan Bautista. Part 2: Seismic velocity structure along the Sierra foothills near Oroville, California N82-13617

ECHOES
Acoustical speckle interferometry and applications in experimental mechanics N82-13826

ECONOMIC ANALYSIS
Environmental and economic comparison of advanced processes for conversion of coal and biomass into clean energy
[PB81-234239] N82-13256

ECONOMIC DEVELOPMENT
Barriers to the utilization of synthetic fuels for transportation
[NASA-CR-165517] N82-13243

ECONOMIC IMPACT
Project Skywater: Fiscal year 1979 report. Atmospheric Resources Research Program
[PB81-234494] N82-13629

ECONOMICS
Program planner's guide to geothermal development in California
[DE82-000700] N82-13527

EDDY CURRENTS
Anamolous loss in transformer steels N82-13371
Feedback plasma control in hybrid poloidal coil system
[IPPJ-542] N82-13905

EDGES
An experimental study of a reinforced concrete folded plate structure with edge beams N82-13443

EDUCATION
Group 4: Instructor training and qualifications N82-13134

EFFERENT NERVOUS SYSTEMS
The influence of motion cues on driver-vehicle performance in a simulator N82-13681
Load compensating reactions to perturbations at wrist joint in normal man N82-13708

EFFICIENCY
A difference in efficiency between synchronous and asynchronous systems
[AD-A102280] N82-13742

EFFLUENTS
H-Coal product physical properties measurement
[DE81-029095] N82-13245

EIGENVALUES
Unsteady aeroelastic modeling and trailing-edge flap control of an experimental wing in a two dimensional wind tunnel N82-13122
A control canonical form for a class of linear hyperbolic systems N82-13786
High order approximations to Eigensolutions of Sturm-Liouville problems by deferred corrections
[TRITA-NA-8104] N82-13800

EINSTEIN EQUATIONS
New exact and asymptotic solutions of the stationary vacuum Einstein equations N82-13973

EJECTORS
Investigation of acoustic interactions in jet thrust augmenting ejectors
[AD-A106083] N82-13835

ELASTIC BUCKLING
An extension to N dimensions of the Von Karman equations N82-13441

ELASTIC DAMPING
Design for active and passive flutter suppression and gust alleviation
[NASA-CR-3482] N82-13147

ELASTIC DEFORMATION
Moment-strain relationships in elastic-plastic bending of beams
[AD-A101722] N82-13446
Behavior of plane panels in ship structures with local initial deflections
[BMVG-FBWT-80-18] N82-13455
Elastic-plastic-fracture analysis of concrete structures N82-13462
Investigation of the acoustic emission and deformation response of finite ice plates
[AD-A103731] N82-13471

ELASTIC MEDIA
Application of the theory of linear elastic materials with voids
[DE81-027903] N82-13452

ELASTIC PLATES
An extension to N dimensions of the Von Karman equations N82-13441

ELASTIC PROPERTIES
Ultrasonic attenuation and velocity studies in the alpha-alpha' solid solution phases of the Nb-H system
[DE81-026618] N82-13836

ELASTIC WAVES
Variable amplitude fatigue testing N82-13278
The influence of pressure waves on measurements of high speed train noise --- high pass filtering of pressure waves
[DFVLR-FB-81-06] N82-13837

ELASTOMERS
Structure-property relationships in segmented elastomers: Small angle X-ray scattering, thermal, and mechanical studies N82-13240

ELASTOPLASTICITY
Dynamic effects on fracture of elastic - plastic materials N82-13463

ELECTRIC ARCS
Antenna (selected articles)
[AD-A106523] N82-13304

ELECTRIC CHARGE
Charge-based modeling of capacitance in MOS transistors N82-13350

ELECTRIC CONDUCTORS
Natural and mutual conductivities of half-wave slots, arbitrarily oriented on the conducting surface of circular cylinder --- slot antennas N82-13331
Bounding signal levels at terminations of multiconductor transmission line behind an aperture
[AD-A102031] N82-13362

ELECTRIC CURRENT
Bounding signal levels at terminations of multiconductor transmission line behind an aperture
[AD-A102031] N82-13362
Two-dimensional effects in power take-off region
[DE82-000091] N82-13367
Current transient spectroscopy of deep levels in silicon N82-13929

ELECTRIC DIPOLES
Radiation of an antenna in the form of a ribbed shaft of finite length N82-13321
Molecular beam electric resonance studies of weakly bound complexes N82-13867

ELECTRIC GENERATORS
Experimental and analytical investigation of a fluidic power generator
[JPL-PUB-81-100] N82-13386
Development of advanced rotor-bearing systems for feedwater pumps, phase 2
[DE82-900376] N82-13431
A preliminary estimate of future communications traffic for the electric power system
[NASA-CR-165015] N82-13493
Alternate hybrid power sources for remote site applications
[AD-A099471] N82-13512
Energy and momentum deposition to plasmas due to the lower hybrid wave by a finite source
[IPPJ-546] N82-13899

ELECTRIC MOTOR VEHICLES
The ac propulsion system for an electric vehicle, phase 1
[NASA-CR-165480] N82-13506

ELECTRIC POTENTIAL
Bounding signal levels at terminations of multiconductor transmission line behind an aperture
[AD-A102031] N82-13362

ELECTRIC POWER PLANTS
Assessment of rotor-bearing dynamics: A planning study for the utility industry
[DE82-900378] N82-13430
Distributed photovoltaic systems: Utility interface issues and their present status
[NASA-CR-165019] N82-13492
Compressed air energy storage: Preliminary design and site development program in an aquifer. Volume 2: Utility system planning
[DE82-000466] N82-13544

ELECTRIC POWER SUPPLIES
Experimental and analytical investigation of a fluidic power generator
[JPL-PUB-81-100] N82-13386

ELECTRIC POWER TRANSMISSION
Bipolar conduction with AC excitation N82-13373
Distributed photovoltaic systems: Utility interface issues and their present status
[NASA-CR-165019] N82-13492

ELECTRIC SWITCHES
Explosive-metal composites and electrical switch technology
[AD-A099476] N82-13361

ELECTRIC WIRE
Review of fire test methods and incident data for portable electric cables in underground coal mines
[PB81-227878] N82-13272

ELECTRICAL ENGINEERING
Compilation of abstracts of dissertations theses, and research papers submitted by candidates for degrees, 1 October 1979 - 30 September 1980
[AD-A104124] N82-13974

ELECTRICAL IMPEDANCE
Radiation of an antenna in the form of a ribbed shaft of finite length N82-13321

ELECTRICAL INSULATION
Conduction and charge storage in electron irradiated spacecraft insulators
[AD-A104796] N82-13167

ELECTRICAL MEASUREMENT
Two-channel telemeter for use in a 3-inch spin air gun
[AD-A102566] N82-13165

ELECTRICAL PROPERTIES
The physical and electrical properties of polycrystalline-silicon N82-13964

ELECTRICAL RESISTIVITY
Natural and mutual conductivities of half-wave slots, arbitrarily oriented on the conducting surface of circular cylinder --- slot antennas N82-13331
Conductivity and permittivity measurements of fast ion conductors in the microwave region N82-13351

ELECTRO-OPTICS
Electrooptic shutter devices utilizing PLZT ceramic wafers
[DE81-025470] N82-13885
Minimum/constant voltage PLZT electrooptic shutters --- lead lanthanum zirconate titanate wafers for flash protective goggles
[DE81-028646] N82-13888
Multifunctions - liquid crystal displays
[BMFT-FB-T-80-181] N82-13957

ELECTROACOUSTIC WAVES
Antenna (selected articles)
[AD-A106474] N82-13311

ELECTROCATALYSTS
Development of a high-temperature durable catalyst for use in catalytic combustors for advanced automotive gas turbine engines
[NASA-CR-165396] N82-13510

ELECTROCHEMICAL CELLS
Endurance test and evaluation of alkaline water electrolysis cells
[NASA-CR-165424] N82-13508

ELECTROCHEMICAL CORROSION
Fatigue crack initiation and electrochemical behavior of 403 stainless steel in aqueous environments N82-13210

ELECTROCHEMISTRY
Energy levels in and on an oxide film as measured by electrochemical methods
[AD-A103704] N82-13187

ELECTRODEPOSITION
Wear properties of electrodeposited titanium diboride coatings
[PB81-233314] N82-13199

ELECTRODES
Surface enhanced Raman spectroscopy for interfacial characterization N82-13175
Metal ion modification of polymeric sulfur nitride, (SN) subx, electrodes and electrochemical reduction of acetylene at a molybdenum modified (SN)sub x electrode N82-13185
Development of the high-temperature redox electrode and improved corrosion rate meter
[DE82-000933] N82-13409
Electrical effects of slag in a diffuse mode magnetohydrodynamic generator N82-13550

ELECTRODYNAMICS
Antenna (selected articles)
[AD-B060598] N82-13307
Two-mirror antenna for radio relay communication N82-13308
Use of principle of regularization in direct and mixed problems of the theory of the synthesis of radiating systems N82-13309

ELECTROLYTES
Colloidal properties of coagulated calcium-montmorillonite suspensions N82-13609
A stochastic Langevin dynamics study of correlated ionic motion in one-dimensonal framework solid electrolytes N82-13966

ELECTROLYTIC CELLS
Endurance test and evaluation of alkaline water electrolysis cells
[NASA-CR-165424] N82-13508

ELECTROMAGNETIC ABSORPTION
Atomic pair processes and laser applications N82-13417
Determination of optical constants from extinction measurements
[AD-A099494] N82-13882

ELECTROMAGNETIC COMPATIBILITY
Effects of the Satellite Power System on low Earth orbit and geosynchronous satellites
[PB81-232019] N82-13157

ELECTROMAGNETIC FIELDS
The use of the Kirchoff method for asymptotic solution of a problem of the diffraction of a plane wave on dielectric bodies of revolution N82-13295

ELECTROMAGNETIC INTERACTIONS
Adaptation of the TH Epsilon Mu formalism for the analysis of the equivalence principle in the presence of the weak and electroweak interaction
[NASA-TM-82450] N82-13851

ELECTROMAGNETIC MEASUREMENT
Antenna (Selected Articles)
[AD-A106522] N82-13297
Methods of automatic measurement of antenna parameters N82-13299

ELECTROMAGNETIC NOISE
Antenna (selected articles)
[AD-A106499] N82-13323
One use of methods of the statistical theory of antennas N82-13325
Digital data compression algorithm performance comparisions: Proposed NATO standard algorithm provides better facsimile in a noisy communications environment than present Tactical Digital Facsimile algorithm
[AD-A103159] N82-13737

ELECTROMAGNETIC PULSES
Bounding signal levels at terminations of multiconductor transmission line behind an aperture
[AD-A102031] N82-13362

ELECTROMAGNETIC RADIATION
Antenna (selected articles)
[AD-A106474] N82-13311
Some properties of the radiating aperture superdirectionality N82-13312
Surface-patch techniques for modeling three-dimensional radiating or scattering objects
[AD-A100212] N82-13336
Electromagnetic cyclotron harmonic waves --- plasma heating
[IPPJ-536] N82-13903

ELECTROMAGNETIC SCATTERING
Surface-patch techniques for modeling three-dimensional radiating or scattering objects
[AD-A100212] N82-13336
A hybrid method which combines a moment method current with an asymptotic current
[AD-A102199] N82-13340

ELECTROMAGNETIC WAVE FILTERS
Linear acousto-optic filtering with heterodyne and frequency-plane control N82-13352

ELECTROMECHANICAL DEVICES
Direct digital simulation of power semiconductor-controlled electrical machines N82-13355

ELECTROMYOGRAPHY
Load compensating reactions to perturbations at wrist joint in normal man N82-13708

ELECTRON BEAMS
Photon-electron correlation in the laboratory testing of electronic components. Part 2: Beam conditioning and diagnostics
[DE81-026606] N82-13365
Electron Beam-Induced Current (EBIC) measurements of heat treated polycrystalline cuprous sulfide/cadimum sulfide solar cells N82-13552
Numerical study on the interaction between a modulated electron beam and a plasma
[IPPJ-543] N82-13906
Electron beam evaporation of superconducting, A15 niobium-silicon N82-13944

ELECTRON CAPTURE
Analytical detection of organic species by means of laser-induced multiphoton ionization N82-13645

ELECTRON COUNTERS
High latitude measurements of the Total Electron Content (TEC) using the Faraday technique and comparisons with TEC estimates from NAVSTAR-GPS data
[AD-A103042] N82-13603

ELECTRON CYCLOTRON HEATING
Electron-cyclotron resonant heated electron distribution functions N82-13920

ELECTRON DENSITY (CONCENTRATION)
JASPIC-DIP: The digital impedance probe in the JASPIC project
[BMFT-FB-W-80-034] N82-13169

ELECTRON DIFFUSION
Energy levels in and on an oxide film as measured by electrochemical methods
[AD-A103704] N82-13187
Electric field-enhanced diffusion and electron stimulated desorption of alkali elements from glass surfaces during electron bombardment and Auger electron analysis N82-13961

ELECTRON DISTRIBUTION
Mechanistic studies of electron exchange kinetics using ab initio
[DE81-026096] N82-13856
Electron-cyclotron resonant heated electron distribution functions N82-13920
Phase separation of a two component electron-hole liquid in (111) stressed Ge N82-13938

ELECTRON ENERGY
Background fitting for electron energy-loss spectra
[DE81-027117] N82-13855
Energy losses and mean free paths of electrons in silicon dioxide
[DE81-026353] N82-13860

ELECTRON FLUX DENSITY
Inverse cerenkov interaction between relativistic electrons and laser light N82-13425

ELECTRON IRRADIATION
HgCdTe fabrication using directed energy techniques
[AD-A105626] N82-13947

ELECTRON MICROSCOPY
Measurement of surface recombination velocity for silicon solar cells using a scanning electron microscope with pulsed beam
[JPL-PUB-81-64] N82-13494

ELECTRON OPTICS
Atmospheric 222Rn measurements at San Nicolas Island during 1980
[AD-A104802] N82-13602

ELECTRON ORBITALS
Shock anomaly and s-d transition in high-pressure lanthanum
[DE81-027659] N82-13948

ELECTRON PLASMA
Review of recent EBT coupled ring-core stability theory N82-13911
Brief survey of experimental investigation of instabilities in microwave-heated plasmas N82-13912
Hot-electron ring stability at the University of Tennessee N82-13914
Stability of hot electron plasma in the ELMO bumpy torus N82-13917
Kinetic stability analyses in a bumpy cylinder N82-13921

ELECTRON SCATTERING
Schwinger's variational principle for electron-ion scattering N82-13844

ELECTRON STATES
Outer-shell excitation in sputtered atoms N82-13839

ELECTRON TRANSITIONS
Outer-shell excitation in sputtered atoms N82-13839
A correlated treatment of bound-continuum transitions within the electron propagator formalism N82-13869

ELECTRONIC CONTROL
The persistence of a visual dominance effect in a telemanipulator task: A comparison between visual and electrotactile feedback N82-13677

ELECTRONIC EQUIPMENT
Photon-electron correlation in the laboratory testing of electronic components. Part 2: Beam conditioning and diagnostics
[DE81-026606] N82-13365

Future directions in Navy electronic system reliability and survivability
[AD-A102460] N82-13438
ELECTRONIC MODULES
Descriptive techniques for digital system containing complex hardware components N82-13754
ELECTRONIC PACKAGING
Magnetically undetectable electronic circuit assemblies
[AD-A100669] N82-13358
Further developments in integrated circuit assembling technology
[BMFT-FB-T-80-179] N82-13369
ELECTRONS
Raman probe of equilibrium and laser modulated populations of electrons and phonons in GaAs N82-13934
ELECTROPLATING
Development of technique for AR coating and nickel and copper metallization of solar cells: FPS project, product development
[NASA-CR-165033] N82-13499
ELECTROSTATIC CHARGE
Electrostatic and hydrodynamic interactions of charged macromolecular systems N82-13242
ELECTROWINNING
Insoluble anodes for electrowinning zinc and other metals
[PB81-227365] N82-13227
ELLIPTICAL CYLINDERS
High frequency scattering from multiple finite elliptic cylinders N82-13291
ELLIPTICAL GALAXIES
Intermediate band surface photometry of elliptical galaxies N82-14035
EMBEDDING
Problems with the multitasking facilities in the ADA programming language
[AD-A105229] N82-13769
EMISSION
Performance characteristics of automotive engines in the United States, third series: 1977 Chrysler 318 CID (5.2L), 2V
[PB81-233025] N82-13435
EMISSION SPECTRA
Fundamental studies of direct current plasmas N82-13895
Narrow passband imagery of comets --- Comet West N82-14014
EMITTERS
Antenna (selected articles)
[AD-B060598] N82-13307
Synthesis of a plane system of discrete emitters N82-13310
FOA 27 control instruments data system. Control instruments and their functions
[FOA-C-20394-D3] N82-13410
EMULSIONS
Molecular interactions in amphiphilic association structures N82-13206
Microemulsions, emulsions and related systems: Energy applications N82-13545
ENCAPSULATING
High resolution, low cost solar cell contact development
[NASA-CR-165032] N82-13501
Investigation of test methods, material properties, and processes for solar cell encapsulants
[NASA-CR-165031] N82-13503
ENCKE METHOD
Regularized integration of gravity-perturbed trajectories: A numerical efficiency study N82-13155
ENERGETIC PARTICLES
Measurements of heavy ions in the low altitude regions of the outer zone
[AD-A099453] N82-13600
ENERGY BANDS
Electron band theory and high pressure equation of state
[DE81-027436] N82-13955
ENERGY BUDGETS
Comparison of data inversion techniques for remotely sensed wide-angle observations of Earth emitted radiation
[NASA-TP-1924] N82-13620
ENERGY CONSERVATION
Appliance efficiency and the solar building
[DE81-029073] N82-13265
Annual cycle energy system experimental performance and national applicability
[DE81-028570] N82-13523
Techniques for energy conservation in ac motor-driven systems
[DE82-900356] N82-13537
A central microprocessor controlled electrical storage heating system
[BMFT-FB-T-80-182] N82-13547
Evaluation of techniques for reducing in-use automotive fuel consumption
[PB81-233298] N82-13985
Highway fuel economy study
[PB81-233850] N82-13986
ENERGY CONSUMPTION
Ultimate in building energy analysis: DOE-2 and BLAST
[DE81-028703] N82-13263
Appliance efficiency and the solar building
[DE81-029073] N82-13265
Water and energy usage in coal preparation
[PB81-238248] N82-13486
ENERGY CONVERSION
Rate coefficients of combustion/fuel conversion reactions by high-temperature photochemistry
[DE81-027965] N82-13192
Experimental and analytical investigation of a fluidic power generator
[JPL-PUB-81-100] N82-13386
Distributed photovoltaic systems: Utility interface issues and their present status
[NASA-CR-165019] N82-13492
A preliminary estimate of future communications traffic for the electric power system
[NASA-CR-165015] N82-13493
Technology assessment of solar energy systems: Availability and impacts of woody biomass utilization in the Pacific Northwest
[DE82-000705] N82-13535
New and renewable energy in the United States of America
[DE81-030887] N82-13539
Treatment of biomass gasification wastewaters using reverse osmosis
[DE82-000698] N82-13566
ENERGY CONVERSION EFFICIENCY
Develop and test fuel cell powered on-site integrated total energy system. Phase 3: Full-scale power plant development
[NASA-CR-165328] N82-13490
High resolution, low cost solar cell contact development
[NASA-CR-165032] N82-13501
Cell module and fuel conditioner development
[NASA-CR-165462] N82-13511
Intermediate photovoltaic system application experiment operational performance report. Volume 2 for Beverly High School, Beverly, Mass.
[DE82-000811] N82-13532
Data report for the northeast residential experiment station, June 1981 --- photovoltaic systems
[DE82-000068] N82-13533
Electrical effects of slag in a diffuse mode magnetohydrodynamic generator N82-13550
ENERGY DISSIPATION
Electric coheating experiment to determine the heat-loss coefficient of a double-envelope house
[DE81-027937] N82-13264
Anamolous loss in transformer steels N82-13371
Background fitting for electron energy-loss spectra
[DE81-027117] N82-13855
Energy losses and mean free paths of electrons in silicon dioxide
[DE81-026353] N82-13860
ENERGY DISTRIBUTION
Low energy X-ray spectrometer
[DE81-025824] N82-13407
Statistical energy analysis computer program, user's guide
[NASA-CR-161913] N82-13764
ENERGY LEVELS
Enhanced energy deposition symmetry by hot electron transport
[DE81-028774] N82-13861
ENERGY POLICY
Power-plant fly-ash utilization: A chemical-processing perspective
[DE81-025452] N82-13191
Barriers to the utilization of synthetic fuels for transportation
[NASA-CR-165517] N82-13243
Natural gas plan needed to provide greater protection for high-priority and critical uses
[PB81-228488] N82-13255
Information resources in the USA on new and renewable energy, a description and directory
[DE81-028867] N82-13522
Building a consensus about energy technologies
[DE82-000501] N82-13536
Microemulsions, emulsions and related systems: Energy applications N82-13545
ENERGY SPECTRA
Energy spectral analysis in projection radiography N82-13293
Low energy X-ray spectrometer
[DE81-025824] N82-13407
ENERGY STORAGE
A preliminary estimate of future communications traffic for the electric power system
[NASA-CR-165015] N82-13493
Alternate hybrid power sources for remote site applications
[AD-A099471] N82-13512
Camelot: A novel concept for a multiterawatt pulse power generator for single pulse burst or repetition rate operation
[AD-A103024] N82-13513
DC dielectric strengths of fluorinated benzenes and the stored-energy theory
[DE81-026515] N82-13516
Computer-automated controls for superconducting magnetic energy storage
[DE81-028697] N82-13521
A central microprocessor controlled electrical storage heating system
[BMFT-FB-T-80-182] N82-13547
ENERGY TECHNOLOGY
Alternate hybrid power sources for remote site applications
[AD-A099471] N82-13512
Information resources in the USA on new and renewable energy, a description and directory
[DE81-028867] N82-13522
Microemulsions, emulsions and related systems: Energy applications N82-13545
Health and safety research division
[DE81-026088] N82-13652
LLNL 1981: Technical horizons
[DE81-028265] N82-14048
ENERGY TRANSFER
Studies of polymer compatibility by nonradiative energy transfer N82-13235
Development, analysis and control of the inductor-converter bridge N82-13349
Environmental impacts of energy transportation
[DE82-900316] N82-13559
On the vibrational energy transfer processes of polyatomic molecules in the gas and solid phases N82-13865
ENGINE CONTROL
Development of a miniaturised digital thrust demand unit N82-13055
Sensor failure detection system --- for the F100 turbofan engine
[NASA-CR-165515] N82-13145
ENGINE DESIGN
Aerodynamic aspects of a high bypass ratio engine installation on a fuselage afterbody N82-13093
An aerodynamic design and the overall stage performance of an air-cooled axial-flow turbine
[NAL-TR-321T] N82-13109
ENGINE INLETS
Aerodynamics of Power Plant Installation
[AGARD-CP-301] N82-13065
Performance of highly integrated inlets for supersonic aircraft N82-13066
Top-mounted inlet system feasibility for transonic-subsonic fighter aircraft applications N82-13067
Some RAE research on shielded and unshielded fuselage mounted air intakes at subsonic and supersonic speeds N82-13068
Prediction and measurement of time-variant, three-dimensional flows in military aircraft intakes N82-13069
Effects of intake geometry on circular pitot intake performance at zero and low forward speeds N82-13070

Subsonic military aircraft engine intake: An integrated theoretical experiment design N82-13073

The design and development of the Tornado engine air intake N82-13074

Wind tunnel tests of powered models: A comparison of two methods of simulating the jets of jet engines N82-13087

Numerical analysis of the scramjet-inlet flow field by using two-dimensional Navier-Stokes equations [NASA-TP-1940] N82-13142

ENGINEERING DRAWINGS

Geometric programming for engineering design optimization N82-13288

ENTIRE FUNCTIONS

Zeros of successive derivatives of some entire functions of infinite order N82-13788

A sharper estimate of the renewal function [CTH-MATH-1980-18] N82-13798

On the dependence of the growth of an entire function of the distribution of the zeros of its derivatives and a conjecture of G. Polya N82-13805

ENVIRONMENT EFFECTS

Environmental and economic comparison of advanced processes for conversion of coal and biomass into clean energy [PB81-234239] N82-13256

Deep Ocean Mining Environmental Study. Environmental effects of commercial-scale mining [PB81-227753] N82-13484

Residual-energy-applications program environmental analysis report --- industrial scale waste heat recovery equipment and utilization [DE81-027538] N82-13525

Program planner's guide to geothermal development in California [DE82-000700] N82-13527

Technology assessment of solar energy systems: Availability and impacts of woody biomass utilization in the Pacific Northwest [DE82-000705] N82-13535

Compressed air energy storage: Preliminary design and site development program in an aquifer. Volume 2: Utility system planning [DE82-000466] N82-13544

Environmental impacts of energy transportation [DE82-900316] N82-13559

National Research and Development Program: Environmental air. Summary --- air pollution monitoring and modeling; effects on people and their environment N82-13571

Environmental hazard rankings of pollutants generated in coal gasification processes [PB81-231698] N82-13576

Environmental assessment of the Alaskan Continental Shelf: Annual reports of principal investigators for the year ending March 1980. Volume 5: Hazards [PB81-225732] N82-13607

Metabolism summaries of selected halogenated organic compounds in human and environmental media, a literature survey: First update [PB81-232811] N82-13655

ENVIRONMENT MANAGEMENT

Artificial Reefs: Proceedings of a Conference [PB81-227779] N82-13644

ENVIRONMENT POLLUTION

Transport and reaction of heavy metals in Alaskan fjord estuaries [DE81-028319] N82-13474

Environmental assessment of the Alaskan Continental Shelf: Annual reports of principal investigators for the year ending March 1980. Volume 5: Hazards [PB81-225732] N82-13607

Metabolism summaries of selected halogenated organic compounds in human and environmental media, a literature survey: First update [PB81-232811] N82-13655

ENVIRONMENT SIMULATORS

Environment simulator for radar signals on the digital level [FOA-A-30025-E4] N82-13343

ENVIRONMENTAL MONITORING

Aircraft data summaries of the SURE intensives, volume 4 [DE82-900311] N82-13569

ENVIRONMENTAL QUALITY

An automated system for global atmospheric sampling using B-747 airliners [NASA-CR-165264] N82-13554

Environmental and radiological safety studies: Interaction of (238) PuO2 heat sources with terrestrial and aquatic environments [DE81-032019] N82-13565

Aircraft data summaries for the SURE intensives, volume 1 [DE82-900314] N82-13568

Aircraft data summaries of the SURE intensives, volume 4 [DE82-900311] N82-13569

ENVIRONMENTAL TESTS

Design, fabrication, test, qualification, and price analysis of third generation design solar cell modules [NASA-CR-165007] N82-13502

EPHEMERIDES

Cometary ephemerides - needs and concerns N82-13995

EPITAXY

Electron beam evaporation of superconducting, A15 niobium-silicon N82-13944

HgCdTe fabrication using directed energy techniques [AD-A105626] N82-13947

EPOXY RESINS

Flammability and photo-stability of selected polymer systems N82-13236

EQUALIZERS (CIRCUITS)

Adaptive equalization algorithms for a dispersive channel [ENST-E-80012] N82-13776

EQUATIONS OF STATE

Theoretical equations of state for metals [DE81-028743] N82-13224

Molecular dynamics calculations for sodium using pseudopotential theory [DE81-029022] N82-13853

EQUIPMENT

The impact of new guidance and control systems on military aircraft cockpit design [AGARD-CP-312] N82-13048

EQUIPMENT SPECIFICATIONS

Practical aspects of instrumentation system installation, volume 13 [NASA-TM-84067] N82-13140

Review of low-voltage CP detonators [DE81-025837] N82-13250

Two-mirror antenna for radio relay communication N82-13308

The message processing and distribution system development [AD-A104585] N82-13333

Future directions in Navy electronic system reliability and survivability [AD-A102460] N82-13438

ERROR ANALYSIS

Compressor stall inducing installation effects of an engine control parameter for the CF-5 aircraft N82-13085

Two-path model of fading in a high data rate communication channel N82-13292

Standard Bit Error Rate (BER) versus received signal level testing [AD-A104573] N82-13338

Probabilistic error analysis of floating point and CRD arithmetics N82-13758

Pointwise error estimation for finite element discretizations, part 1 [TRITA-NA-8105-PT-1] N82-13801

An upper asymptote for the three-parameter logistic item-response model [AD-A103013] N82-13816

ERROR CORRECTING CODES

Capacity and coding for computer memory with defects N82-13750

An algebraic model of fault masking logic N82-13804

ERROR FUNCTIONS

Error bounds for reconstruction of a function f from a finite sequence (SGN(ft sub i) + x sub i)) [AD-A104477] N82-13795

ERRORS

Standard Bit Error Rate (BER) versus received signal level testing [AD-A104573] N82-13338

Modeling human tracking error in several different anti-tank systems N82-13699

On the internal target model in a tracking task N82-13700

ESTIMATES

A sharper estimate of the renewal function [CTH-MATH-1980-18] N82-13798

ESTIMATING

Estimation of variable latency signals via unwrapped phase averaging with application to visual evoked potentials N82-13347

New optimization research [AD-A104864] N82-13793

ESTUARIES

Transport and reaction of heavy metals in Alaskan fjord estuaries [DE81-028319] N82-13474

ETHERS

Effect of solvents on the radiation-induced polymerization of ethyl and isopropyl vinyl ethers N82-13238

ETHYL ALCOHOL

Feasibility study report for the Imperial Valley Ethanol Refinery: A 14.9-million-gallon-per-year ethanol synfuel refinery utilizing geothermal energy [DE82-000288] N82-13252

Neurotransmitter function in the basal ganglia after acute and chronic ethanol treatment [AD-A103744] N82-13649

ETHYL COMPOUNDS

Constitution of silicate anions in tetraethyl-ammonium silicates and their aqueous solutions [NRC/CNR-TT-2004] N82-13170

Gas-solid chromatography on cation forms of lightly sulfonated porous polymers N82-13237

Effect of solvents on the radiation-induced polymerization of ethyl and isopropyl vinyl ethers N82-13238

ETHYLENE

Metal ion modification of polymeric sulfur nitride, (SN) subx, electrodes and electrochemical reduction of acetylene at a molybdenum modified (SN)sub x electrode N82-13185

ETHYLENE COMPOUNDS

Investigation of test methods, material properties, and processes for solar cell encapsulants [NASA-CR-165031] N82-13503

EUCLIDEAN GEOMETRY

Algorithms for the geometry of semi-algebraic sets N82-13763

EUROPEAN SPACE PROGRAMS

Plans for Comet Halley --- ESA's Giotto mission, Japan's Planet-A mission, and the U.S.S.R. Venera-Halley mission N82-14024

The ESA mission to Comet Halley N82-14025

EUTECTIC ALLOYS

A quantitative study of factors influencing lamellar eutectic morphology during solidification [NASA-TM-82451] N82-13218

Cyclic deformation and fatigue microcrack initiation in pearlitic eutectoid steel N82-13230

EVAPORATION

Energetics and dynamics of droplet evaporation in high temperature intermediate Reynolds number flows N82-13379

Design procedures for a commercial scale thermal evaporation system to deposit CdS for solar cell manufacture N82-13551

Inclusive charged particle spectrum from the interaction of nuclei with intermediate energy proton N82-13848

Fluorescent guest-host effect in scattering liquid crystals and new physical phenomena in thin liquid crystal films N82-13940

Electron beam evaporation of superconducting, A15 niobium-silicon N82-13944

HgCdTe fabrication using directed energy techniques [AD-A105626] N82-13947

EXCITATION

Excitation of radial resonator with annular slot N82-13328

EXHAUST EMISSION

Effect of fuel-air-ratio nonuniformity on emissions of nitrogen oxides [NASA-TP-1798] N82-13143

Pilot-scale development of a low-NOx coal-fired tangential system [PB81-242513] N82-13270

Proton-induced X-ray emission analysis: A complement to analytical methods used in environmental studies
[DE81-029012] N82-13557
Control of hydrocarbons and carbon monoxide via catalytic incineration
[DE82-000508] N82-13560

EXHAUST FLOW SIMULATION
Wind tunnel test and analysis techniques using powered simulators for civil nacelle installation drag assessment N82-13088
Establishment of an experimental technique to provide accurate measurement of the installed drag of close coupled civil nacelle/airframe configurations, using a full span model with turbine powered engine simulators N82-13089

EXHAUST GASES
Pilot-scale development of a low-NOx coal-fired tangential system
[PB81-242513] N82-13270
Cyclic compression, combustion and expansion of a fuel and air mixture in a cylinder containing a catalyst
[PB81-232480] N82-13434
Control of hydrocarbons and carbon monoxide via catalytic incineration
[DE82-000508] N82-13560

EXHAUST NOZZLES
Aerodynamics of Power Plant Installation
[AGARD-CP-301] N82-13065
Integration of advanced exhaust nozzles N82-13075
Advanced exhaust nozzle technology N82-13078
A numerical investigation of exhaust plume temperature effects on nonaxisymmetric nozzle/afterbody performance N82-13079
Evaluation of an experimental technique to investigate the effects of the engine position on engine/pylon/wing interference N82-13090
Flow characteristics of a multiple nozzle exhaust gas eductor system
[AD-A104072] N82-13387

EXHAUST SYSTEMS
Investigation of acoustic interactions in jet thrust augmenting ejectors
[AD-A106083] N82-13835

EXHAUST VELOCITY
Determination of two-stroke engine exhaust noise by the method of characteristics
[NASA-TM-84061] N82-13827

EXPANSION
Micromechanics of expansive mechanisms in expansive cement concretes N82-13258
Underexpanded free jets and their interaction with adjacent surfaces
[LOG-J12276] N82-13385
Design and development of a reciprocating low-temperature freon expander
[DE81-028609] N82-13392

EXPERIMENTAL DESIGN
The influence of closed-coupled, rear fuselage mounted nacelles on the design of an advanced high speed wing N82-13092
Some experimental design techniques in image processing problems N82-13782
Detection of infrasound generated by Clear Air Turbulence (CAT) N82-13830
Laboratory study of sound propagation into a fast bottom medium
[AD-A104596] N82-13831
Laboratory measurements of the cometary photochemical phenomena N82-14023

EXPERIMENTATION
Soviet UCG experience specifically related to field experiments in the United States
[DE81-028642] N82-13244
Laboratory Research --- spectroscopic analysis, photochemical reactions, and proton irradiation of ice N82-14022

EXPLORER 55 SATELLITE
Ionospheric scintillation N82-13585

EXPLOSIONS
Testing of a work bench for handling of explosives in the laboratory
[FOA-C-20393-D1] N82-13397

EXPLOSIVES
Evaluation of low-chlorine TATB from a production source
[DE81-025474] N82-13249
Review of low-voltage CP detonators
[DE81-025837] N82-13250
Performance of chemical analogs of the explosive CP
[DE81-025836] N82-13251
Explosive-metal composites and electrical switch technology
[AD-A099476] N82-13361

EXPOSURE
Gamma ray buildup factors in lead-iron and iron-lead shields
[EUR-7086-EN] N82-13864

EXTERNAL STORES
Prediction of aerodynamic loads on aircrafts with external stores at transonic speeds N82-13813

EXTERNAL SURFACE CURRENTS
Molecular beam electric resonance studies of weakly bound complexes N82-13867

EXTRACTION
Soviet UCG experience specifically related to field experiments in the United States
[DE81-028642] N82-13244
Separations Science data base: An abstractor's manual
[DE81-029101] N82-13977

EXTRAPOLATION
A method for accelerating convergence to the solution of nonlinear structural equations by reducing residual work N82-13439

EYE MOVEMENTS
Dynamic measurement of human vertical fusional response N82-13660

F

F-14 AIRCRAFT
Limited evaluation of an F-14A airplane utilizing an aileron-rudder interconnect control system in the landing configuration
[NASA-TM-81972] N82-13148

F-18 AIRCRAFT
F/A 18 Hornet crew station N82-13064

FABRICATION
Explosive-metal composites and electrical switch technology
[AD-A099476] N82-13361
High resolution, low cost solar cell contact development
[NASA-CR-165032] N82-13501
Design, fabrication, test, qualification, and price analysis of third generation design solar cell modules
[NASA-CR-165007] N82-13502
Cell module and fuel conditioner development
[NASA-CR-165462] N82-13511
HgCdTe fabrication using directed energy techniques
[AD-A105626] N82-13947

FABRY-PEROT INTERFEROMETERS
Spectral imagery: Recent results with the SPIFI and their implications for cometary atmospheric studies --- servocontrolled polarimetric imaging Fabry-Perot interferometer N82-14011

FACTORIAL DESIGN
The relationship between the number of factors and size of an experiment --- a medical diagnostics case
[AD-A103877] N82-13792

FAILURE ANALYSIS
Surface failure of CO2 laser irradiated glass
[AD-A105454] N82-13421
Asymmetric stress and failure analysis
[DE81-026842] N82-13451
Confidence intervals for the reliability of a future system configuration
[AD-A105031] N82-13814
Statistical analysis of accelerated temperature aging of semiconductor devices
[AD-A099439] N82-13946

FAILURE MODES
Fatigue testing of fibre composites N82-13280
Surface failure of CO2 laser irradiated glass
[AD-A105454] N82-13421
Elastic-plastic-fracture analysis of concrete structures N82-13462
Computer-automated controls for superconducting magnetic energy storage
[DE81-028697] N82-13521

FAN BLADES
Thrust modulation methods for a subsonic V/STOL aircraft
[NASA-TM-82747] N82-13112

FAR INFRARED RADIATION
Far infrared source classification system --- digital system
[ENST-E-80005] N82-13891

FAR ULTRAVIOLET RADIATION
A vacuum ultraviolet radiation source using Cerenkov radiation N82-13894

FARADAY EFFECT
High latitude measurements of the Total Electron Content (TEC) using the Faraday technique and comparisons with TEC estimates from NAVSTAR-GPS data
[AD-A103042] N82-13603

FATIGUE (MATERIALS)
Fatigue crack propagation studies in two cryogenic steels N82-13213
Mechanisms by which humidity alters ductility
[AD-A105530] N82-13221
Endurance test and evaluation of alkaline water electrolysis cells
[NASA-CR-165424] N82-13508
Push-pull fatigue of LiF and MgO single crystals N82-13960

FATIGUE LIFE
Fatigue crack initiation and electrochemical behavior of 403 stainless steel in aqueous environments N82-13210
An investigation of notch low cycle fatigue life behavior of Rene' 80 at high temperature N82-13214
The role of fatigue testing N82-13275
Fatigue test machines N82-13277
On-line computers in fatigue testing N82-13279
Fatigue testing of fibre composites N82-13280
Elevated temperature fatigue testing of metals N82-13281
Monitoring of damage in fibre composites N82-13284
Evaluation of creep-fatigue life-prediction models for the solar central receiver
[DE82-000942] N82-13529

FATIGUE TESTING MACHINES
Fatigue Test Methodology
[AGARD-LS-118] N82-13274
The role of fatigue testing N82-13275
Fatigue test machines N82-13277
Variable amplitude fatigue testing N82-13278
On-line computers in fatigue testing N82-13279
Methods of obtaining crack growth data in metals N82-13283

FATIGUE TESTS
The role of fatigue testing N82-13275
Planning and analysis of a fatigue test programme N82-13276
On-line computers in fatigue testing N82-13279
Fatigue testing of fibre composites N82-13280
Elevated temperature fatigue testing of metals N82-13281
Fatigue tests with a corrosive environment N82-13282
Monitoring of damage in fibre composites N82-13284
Cyclic strain approach to fatigue in metals N82-13285

FAULT TOLERANCE
Future directions in Navy electronic system reliability and survivability
[AD-A102460] N82-13438
An algebraic model of fault masking logic N82-13804

FEASIBILITY ANALYSIS
Feasibility study report for the Imperial Valley Ethanol Refinery: A 14.9-million-gallon-per-year ethanol synfuel refinery utilizing geothermal energy
[DE82-000288] N82-13252

FEEDBACK CONTROL
Comparison of closed loop model with flight test results N82-13691
Functional structure and dynamics of the human nervous system N82-13692
On the use of the OCM's quadratic objective function as a pilot rating metric N82-13693
Information and display requirements for aircraft terrain following N82-13695
The role of manipulator characteristics in selecting the ideal effective vehicle N82-13704

Computer aided manual tracking N82-13705
Experimental results with a six-degree-of-freedom force-reflecting hand controller N82-13707
Feedback plasma control in hybrid poloidal coil system
[IPPJ-542] N82-13905

FERMIONS
Long-range interactions in lattice field theory N82-13941

FERRIC IONS
Mechanistic studies of electron exchange kinetics using ab initio
[DE81-026096] N82-13856

FERRITIC STAINLESS STEELS
Fatigue crack propagation studies in two cryogenic steels N82-13213

FERROFLUIDS
Benefication with magnetic fluids
[PB81-227126] N82-13485

FERROMAGNETIC RESONANCE
An investigation of some magnetic properties of calcium substituted yttrium iron garnet films N82-13935

FERROUS METALS
Mechanistic studies of electron exchange kinetics using ab initio
[DE81-026096] N82-13856

FIBER COMPOSITES
Fatigue testing of fibre composites N82-13280
Monitoring of damage in fibre composites N82-13284

FIBER OPTICS
The 30/20 GHz communications satellite trunking network study
[NASA-CR-165467] N82-13302
Fiber optics (optical waveguides) technology: Potential application in the DCS
[AD-A104740] N82-13303
Three-5 heterostructure avalanche photodiode modules for fiber optic communication links in the 1.0 to 1.3 micrometer spectral range
[AD-A099506] N82-13334
Single mode optical waveguide design investigation
[AD-A098979] N82-13881
Time dependent recording of images transmitted over optical fibers
[DE81-026599] N82-13889
Fiber optic quality assurance at the Nevada Test Site
[DE81-028740] N82-13890
Fiber optic time domain reflectometers: Approaches to performance improvement N82-13893
Fiber optic analog and timing monitoring system for the Antares laser fusion program
[DE81-028799] N82-13925

FIBER REINFORCED COMPOSITES
Creep and creep rupture of laminated graphite/epoxy composites N82-13173

FIBER STRENGTH
Fatigue testing of fibre composites N82-13280

FIELD OF VIEW
Scanner --- photography from a spin stabilized synchronous satellite
[NASA-CASE-GSC-12032-2] N82-13465
Interpolating for the location of remote sensor data
[NASA-TM-82169] N82-13469
Comparison of data inversion techniques for remotely sensed wide-angle observations of Earth emitted radiation
[NASA-TP-1924] N82-13620
Some effects of Field Of View (FOV) and target size on lateral tracking at hover N82-13672

FIELD STRENGTH
DC dielectric strengths of fluorinated benzenes and the stored-energy theory
[DE81-026515] N82-13516

FIELD THEORY (PHYSICS)
Experimental and theoretical investigations with laboratory models of phased array antenna
[BMVG-FBWT-79-21] N82-13341
Nuclear slab collision in a relativistic quantum field theory
[DE81-028132] N82-13972

FIGHTER AIRCRAFT
Aerodynamics of Power Plant Installation
[AGARD-CP-301] N82-13065
Performance of highly integrated inlets for supersonic aircraft N82-13066
Top-mounted inlet system feasibility for transonic-subsonic fighter aircraft applications N82-13067
Some RAE research on shielded and unshielded fuselage mounted air intakes at subsonic and supersonic speeds N82-13068
Prediction and measurement of time-variant, three-dimensional flows in military aircraft intakes N82-13069
The subsonic performance of practical military variable area convergent nozzles N82-13076
Final report on the FueFo-4 major theme: Interference drag with airframe/engine integration on fighter aircraft
[BMVG-FBWT-79-20] N82-13116
Maneuver load control for the reduction of design loads and improvement of the maneuverability of modern fighter aircraft
[BMVG-FBWT-81-2] N82-13138

FINITE DIFFERENCE THEORY
Calculation of wing-body-nacelle interference in subsonic and transonic potential flow N82-13095
Numerical analysis of the scramjet-inlet flow field by using two-dimensional Navier-Stokes equations
[NASA-TP-1940] N82-13142
Numerical study of multicellular natural convection in vertical cavities N82-13403

FINITE ELEMENT METHOD
Calculation of transonic air-intakes using a computer package for inviscid and boundary layer flows N82-13072
A solution of the Navier-Stokes equations by a mixed finite element method
[ONERA-NT-1981-1] N82-13398
Analysis of multicylinder IC-Engine crankshafts with hydrodynamic bearings using a finite element-transfer matrix approach N82-13437
Inelastic overload analysis of continuous steel multi-girder highway bridges by the finite-element method N82-13440
MAGNA: A finite element program for the materially and geometrically nonlinear analysis of three-dimensional structures subjected to static and transient loading
[AD-A099454] N82-13448
Analysis of the development of shallow groundwater supplies by pumping from ponds
[PB81-231904] N82-13476
User's manuals for DYNA3D and DYNAP: Nonlinear dynamic analysis of solids in three dimensions
[DE81-028360] N82-13772
MERLIN: A computer program to transfer finite-element meshes
[DE82-000806] N82-13775
A mixed variational principle for finite element analysis N82-13789
Error bounds for reconstruction of a function f from a finite sequence (SGN(ft sub i) + x sub i))
[AD-A104477] N82-13795
Pointwise error estimation for finite element discretizations, part 1
[TRITA-NA-8105-PT-1] N82-13801

FINLAND
Sulfur in the air in the capital (Helsinki) metropolitan area: ITASAT-project
[RR-614.71] N82-13553
Magnetic results from Nurmijaervi Geophysical Observatory 1980, No. 22
[ISBN-951-697-155-5] N82-13590

FINNED BODIES
Transitional ballistics of hypervelocity projectiles
[BMVG-FBWT-80-1] N82-13163

FIR FILTERS
Frequency sampling filters, design and applications N82-13354

FIRE EXTINGUISHERS
Development and testing of dry chemicals in advanced extinguishing systems for jet engine nacelle fires
[NASA-CR-165011] N82-13186

FIRES
Review of fire test methods and incident data for portable electric cables in underground coal mines
[PB81-227878] N82-13272

FISHERIES
Biological and physical oceanographic observations pertaining to the trawl fishery in a region of persistent coastal upwelling
[NASA-TM-81332] N82-13637
Artificial Reefs: Proceedings of a Conference
[PB81-227779] N82-13644

FISSILE FUELS
Plasma focus breeder
[IPPJ-541] N82-13904

FIXED POINT ARITHMETIC
Probabilistic error analysis of floating point and CRD arithmetics N82-13758

FIXED POINTS (MATHEMATICS)
The least fixed point property for omega chain continuous functions N82-13787

FLAME RETARDANTS
Flammability and photo-stability of selected polymer systems N82-13236

FLAME TEMPERATURE
Gas turbine combustor soot and radiation N82-13174

FLAMMABILITY
Flammability and photo-stability of selected polymer systems N82-13236

FLASH POINT
Controlled-flash pyrolysis
[DE82-000284] N82-13196

FLAT CONDUCTORS
Method of the study of complex waveguide junctions with one or several regions of communication N82-13316

FLAT PLATES
An experimental investigation of the turbulent flow in the junction of a flat plate and a body of constant thickness N82-13102
Turbulent wake development behind streamlined bodies N82-13104
On the buckling force of floating ice plates
[AD-A103733] N82-13472
A Module Experimental Process System Development Unit (MEPSDU)
[NASA-CR-165014] N82-13496

FLEXIBILITY
Dynamic analysis of flexible spatial mechanisms and robotic manipulators N82-13460

FLEXIBLE SPACECRAFT
Shape determination and control for large space structures
[JPL-PUB-81-71] N82-13166
On the modeling and control of flexible space structures N82-13168

FLEXING
Thermal contraction and flexure of intracratonic basins: A three dimensional study of the Michigan Basin N82-13582

FLIGHT CHARACTERISTICS
Further tests of a model-based scheme for predicting pilot opinion ratings for large commercial transports N82-13687
Comparison of closed loop model with flight test results N82-13691

FLIGHT CONTROL
Limited evaluation of an F-14A airplane utilizing an aileron-rudder interconnect control system in the landing configuration
[NASA-TM-81972] N82-13148
Interactive aircraft flight control and aeroelastic stabilization --- forward swept wing flight vehicles
[NASA-CR-165036] N82-13150
Functional structure and dynamics of the human nervous system N82-13692
On the use of the OCM's quadratic objective function as a pilot rating metric N82-13693

FLIGHT CREWS
Tanker avionics and aircrew complement evaluation N82-13063
F/A 18 Hornet crew station N82-13064
Guidelines for line-oriented flight training, volume 2
[NASA-CP-2184-VOL-2] N82-13123
Issues related to line-oriented flight training N82-13124
Line-oriented flight training: Northwest Airlines N82-13125
United Airlines LOFT training N82-13126
Eastern Airlines LOFT program N82-13127
Texas International Airlines LOFT program N82-13128
Delta Airlines LOFT training N82-13129
American Airlines LOFT evaluation program N82-13130
Group 1: Scenario design and development issues N82-13131
Group 2: Real time LOFT operations N82-13132

Group 3: Performance evaluation and assessment N82-13133

FLIGHT PLANS
Launch mission summary: Intelsat 5 (F3) Atlas/Centaur-55
[NASA-TM-84068] N82-13161

FLIGHT SIMULATION
Use of a helmet-mounted matrix display for presenting energy-maneuverability information during simulated close combat N82-13061

FLIGHT SIMULATORS
A real time Pegasus propulsion system model for VSTOL piloted simulation evaluation
[NASA-TM-82770] N82-13144

FLIGHT TEST INSTRUMENTS
Practical aspects of instrumentation system installation, volume 13
[NASA-TM-84067] N82-13140

FLIGHT TESTS
Experimental and analytical investigation of a fluidic power generator
[JPL-PUB-81-100] N82-13386
Report on research and technology-FY 1981
[NASA-TM-81367] N82-14047

FLIGHT TIME
Electronic master monitor and advisory display system test and demonstration report
[AD-A105317] N82-13141

FLIGHT TRAINING
Guidelines for line-oriented flight training, volume 2
[NASA-CP-2184-VOL-2] N82-13123
Issues related to line-oriented flight training N82-13124
Line-oriented flight training: Northwest Airlines N82-13125
United Airlines LOFT training N82-13126
Eastern Airlines LOFT program N82-13127
Texas International Airlines LOFT program N82-13128
Delta Airlines LOFT training N82-13129
American Airlines LOFT evaluation program N82-13130
Group 1: Scenario design and development issues N82-13131
Group 2: Real time LOFT operations N82-13132
Group 3: Performance evaluation and assessment N82-13133
Group 4: Instructor training and qualifications N82-13134

FLOATING POINT ARITHMETIC
On the buckling force of floating ice plates
[AD-A103733] N82-13472
Probabilistic error analysis of floating point and CRD arithmetics N82-13758

FLOOD PLAINS
Five-year water resources research plan, 1982-1987
[PB81-231938] N82-13479

FLOW
Determination of two-stroke engine exhaust noise by the method of characteristics
[NASA-TM-84061] N82-13827

FLOW CHARACTERISTICS
An approximate analytical method for vortex-lift and center of pressure on the slender wing
[NASA-TM-83198] N82-13045
The influence of closed-coupled, rear fuselage mounted nacelles on the design of an advanced high speed wing N82-13092
Experimental and analytical investigation of a fluidic power generator
[JPL-PUB-81-100] N82-13386

FLOW DISTRIBUTION
Subsonic military aircraft engine intake: An integrated theoretical experiment design N82-13073
Model testing techniques for measuring inlet drag N82-13084
The role and implementation of different nacelle/engine simulation concepts for wind-tunnel testing in research and development work on transport aircraft N82-13086
Contributions to the aerodynamics of wing-body configurations in the nonlinear range of angles of attack
[BMVG-FBWT-80-11] N82-13117
Numerical analysis of the scramjet-inlet flow field by using two-dimensional Navier-Stokes equations
[NASA-TP-1940] N82-13142
Underexpanded free jets and their interaction with adjacent surfaces
[LOG-J12276] N82-13385
The transonic flow field for a fluidic-generator fuze assembly
[AD-A099616] N82-13388
Flow distribution control characteristics in marine gas turbine waste-heat recovery systems. Phase 1: Flow distribution characteristics and control in diffusers
[AD-A104560] N82-13390
A review of one-dimensional oceanic mixed-layer models
[AD-A103279] N82-13640

FLOW EQUATIONS
Prediction and measurement of time-variant, three-dimensional flows in military aircraft intakes N82-13069
Navier-Stokes solutions for a supersonic coflowing axisymmetric nozzle with a thick annulus N82-13101
Separate numerical treatment of attached and detached flow regions in general viscous flows N82-13375
Lagrangian fluid dynamics using the Voronoi-Delaunay mesh
[LA-UR-81-1421] N82-13393
An initial study of the application of the numerical method of characteristics to unsteady flow analysis in partially filled gravity drainage sized pipes
[PB81-229189] N82-13399
Coexistence of non-registered monolayer and bilayer solid films N82-13931

FLOW MEASUREMENT
Prediction and measurement of time-variant, three-dimensional flows in military aircraft intakes N82-13069
Prop-fan integration at cruise speeds N82-13097
An experimental investigation of the flow past a finite circular cylinder at a low subcritical Reynolds number N82-13105
H-Coal product physical properties measurement
[DE81-029095] N82-13245
Numerical wind-speed simulation model
[DE82-000956] N82-13627
Theoretical analysis of the effects of turbulence on a mobile parametric receiver
[AD-A101418] N82-13833

FLOW STABILITY
Numerical study of multicellular natural convection in vertical cavities N82-13403
Transmission of sound across a vortex layer enclosing a cylindrical column of jet N82-13838

FLOW THEORY
Prop-fan integration at cruise speeds N82-13097
Crossflow effects on steady and fluctuating pressures on an ogive-cylinder cone-frustum model in supersonic separated flow
[NASA-TP-1951] N82-13108
Lagrangian fluid dynamics using the Voronoi-Delaunay mesh
[LA-UR-81-1421] N82-13393

FLOW VELOCITY
Investigation of the vortex field generated by an airfoil model in a wind tunnel, using ultrasonic pulses
[MPIS-MITT-69] N82-13118
Separate numerical treatment of attached and detached flow regions in general viscous flows N82-13375
Mixing of a passive scalar in isotropic and sheared homogeneous turbulence N82-13405
Infiltration and indoor air quality in energy efficient houses in Eugene, Oregon
[DE82-000971] N82-13561

FLUCTUATION THEORY
Investigation of fluctuation phenomena in dye lasers N82-13419

FLUID DYNAMICS
Two studies of fluidized beds: Heat transfer and grid jets N82-13203
Numerical methods for the analysis of fluid-structure interaction problems N82-13381
Rayleigh-Taylor stability for a shock wave-density discontinuity interaction
[DE81-028707] N82-13394

FLUIDICS
Experimental and analytical investigation of a fluidic power generator
[JPL-PUB-81-100] N82-13386

FLUIDIZED BED PROCESSORS
High-temperature measurements of alkali levels in an experimental 6-inch AFBC
[DE81-023632] N82-13193
Reduction of nitric oxide in a fluidized bed
[DE81-030488] N82-13198
Two studies of fluidized beds: Heat transfer and grid jets N82-13203
An experimental study of heat transfer to a horizontal tube in a large particle fluidized bed at elevated temperature N82-13406

FLUORESCENCE
On the vibrational energy transfer processes of polyatomic molecules in the gas and solid phases N82-13865
Fluorescent guest-host effect in scattering liquid crystals and new physical phenomena in thin liquid crystal films N82-13940

FLUORIDES
Critically evaluated data on optical and transport properties of solids (refractive index and absorption coefficient of selected optical materials)
[AD-A105059] N82-13879

FLUOROHYDROCARBONS
DC dielectric strengths of fluorinated benzenes and the stored-energy theory
[DE81-026515] N82-13516

FLUTTER
Unsteady aeroelastic modeling and trailing-edge flap control of an experimental wing in a two dimensional wind tunnel N82-13122
Design for active and passive flutter suppression and gust alleviation
[NASA-CR-3482] N82-13147

FLUTTER ANALYSIS
Interactive aircraft flight control and aeroelastic stabilization --- forward swept wing flight vehicles
[NASA-CR-165036] N82-13150

FLUX DENSITY
Planetary radio astronomy observations from Voyager-2 near Saturn
[NASA-TM-83856] N82-14037

FOCI
Phase measurments in the focal region of an aberrated lens N82-13875

FORCED VIBRATION
Influence of sine, and random, whole-body vibration on visual acuity
[BMVG-FBWT-79-17] N82-13653

FORMALISM
Symbolic reasoning among 3-D models and 2-D images N82-13761
Methods of verification of digital logic N82-13783
Proving total correctness of nondeterministic programs in infinitary logic
[MC-IW-150/80] N82-13799

FORMATIONS
A depositional model for major coal seams in the Rock Springs Formation, Upper Cretaceous, southwest Wyoming N82-13580

FORMULAS (MATHEMATICS)
Proving total correctness of nondeterministic programs in infinitary logic
[MC-IW-150/80] N82-13799

FORTRAN
Digital Equipment Corporation VAX-11 FORTRAN, version 2
[PB81-232431] N82-13745
Solving multiactivity multifaciility capacity-constrained 0-1 assignment problems
[AD-A102583] N82-13796
Computer programs for line shape analysis of X-ray diffraction peaks --- thin film analysis
[PB81-227787] N82-13958

FORWARD SCATTERING
Ionospheric scintillation N82-13585

FOSSIL FUELS
Rate coefficients of combustion/fuel conversion reactions by high-temperature photochemistry
[DE81-027965] N82-13192
Assessment of rotor-bearing dynamics: A planning study for the utility industry
[DE82-900378] N82-13430
Development of advanced rotor-bearing systems for feedwater pumps, phase 2
[DE82-900376] N82-13431
Development of peatlands in northern Minnesota
[DE82-000873] N82-13475
Design and test of two-step solar oil shale retort
[DE82-000964] N82-13543

Update on Specified European R and D Efforts. Part 1: Appendices
[DE81-026404] N82-13983

FOUNDATIONS
Evaluation of reef shell embankment
[PB81-232761] N82-13266
Analysis and behavior of structures on discrete tensionless foundations N82-13286

FOURIER SERIES
The relationship between the acoustic impedance and unsteady flow field near the orifice of a two dimensional Helmholtz resonator in grazing flow N82-13378
Thermoelastic instability in a seal-like configuration N82-13436

FRACTURE MECHANICS
Planning and analysis of a fatigue test programme N82-13276
Elastic-plastic-fracture analysis of concrete structures N82-13462
Investigation of the acoustic emission and deformation response of finite ice plates
[AD-A103731] N82-13471

FRACTURE STRENGTH
Monitoring of damage in fibre composites N82-13284

FRACTURES (MATERIALS)
Dynamic effects on fracture of elastic - plastic materials N82-13463

FREE CONVECTION
Numerical study of multicellular natural convection in vertical cavities N82-13403

FREE ELECTRONS
Role of electron swarm studies in the development of gaseous dielectrics
[DE81-026349] N82-13952

FREE JETS
Underexpanded free jets and their interaction with adjacent surfaces
[LOG-J12276] N82-13385

FREON
Design and development of a reciprocating low-temperature freon expander
[DE81-028609] N82-13392
Heat pipe startup from the supercritical state N82-13400

FREQUENCY CONVERTERS
Techniques for energy conservation in ac motor-driven systems
[DE82-900356] N82-13537

FREQUENCY DISTRIBUTION
Principles of the construction of systems, which possess potential frequency independence --- antenna design N82-13330

FREQUENCY DIVIDERS
Antenna (selected articles)
[AD-A106499] N82-13323
Directed dividers on the metal-dielectric waveguides N82-13326

FREQUENCY DIVISION MULTIPLEXING
Energy spectral analysis in projection radiography N82-13293

FREQUENCY MODULATION
Beam propagation in the frequency-converted subsystems of Nova and Novette
[DE81-028253] N82-13862

FREQUENCY RANGES
Visual/motion cue mismatch in a coordinated roll maneuver
[NASA-CR-166259] N82-13664

FROZEN EQUILIBRIUM FLOW
On a dusty-gas shock tube
[UTIAS-250] N82-13151

FRUSTUMS
Crossflow effects on steady and fluctuating pressures on an ogive-cylinder cone-frustum model in supersonic separated flow
[NASA-TP-1951] N82-13108

FUEL CELLS
Asymmetric stress and failure analysis
[DE81-026842] N82-13451
Develop and test fuel cell powered on-site integrated total energy system. Phase 3: Full-scale power plant development
[NASA-CR-165328] N82-13490

FUEL COMBUSTION
Effect of fuel-air-ratio nonuniformity on emissions of nitrogen oxides
[NASA-TP-1798] N82-13143
Gas turbine combustor soot and radiation N82-13174
Rate coefficients of combustion/fuel conversion reactions by high-temperature photochemistry
[DE81-027965] N82-13192
Pilot-scale development of a low-NOx coal-fired tangential system
[PB81-242513] N82-13270
Catalytic combustion of residual fuels
[NASA-TM-82731] N82-13504
Environmental effects of pollutants from coal combustion. 1: The Four Corners Power Plant, Farmington, N.M.
[PB81-230427] N82-13572
Environmental effects of pollutants from coal combustion. 2: The Colstrip, Montana Power Plant
[PB81-234114] N82-13573

FUEL CONSUMPTION
Performance characteristics of automotive engines in the United States, third series: 1977 Chrysler 318 CID (5.2L), 2V
[PB81-233025] N82-13435
Controlled Speed Accessory Drive demonstration program
[NASA-CR-165010] N82-13981
Evaluation of techniques for reducing in-use automotive fuel consumption
[PB81-233298] N82-13985
Highway fuel economy study
[PB81-233850] N82-13986

FUEL PRODUCTION
Controlled-flash pyrolysis
[DE82-000284] N82-13196
Low/medium Btu coal gasification assessment program for potential users in New Jersey: Executive summary
[DE81-025475] N82-13247
Feasibility study report for the Imperial Valley Ethanol Refinery: A 14.9-million-gallon-per-year ethanol synfuel refinery utilizing geothermal energy
[DE82-000288] N82-13252
Creating a safer environment in US coal mines: The Bureau of Mines Methane Control Program, 1964-79
[PB81-233918] N82-13488
Solar-central-receiver fuels and chemicals
[DE82-000941] N82-13530

FUEL TESTS
Low/medium Btu coal gasification assessment program for potential users in New Jersey: Executive summary
[DE81-025475] N82-13247
Catalytic combustion of residual fuels
[NASA-TM-82731] N82-13504

FUEL-AIR RATIO
Effect of fuel-air-ratio nonuniformity on emissions of nitrogen oxides
[NASA-TP-1798] N82-13143
Cyclic compression, combustion and expansion of a fuel and air mixture in a cylinder containing a catalyst
[PB81-232480] N82-13434
Catalytic combustion of residual fuels
[NASA-TM-82731] N82-13504

FUNCTIONAL DESIGN SPECIFICATIONS
Residual-energy-application program: EAST facility requirements document, volume 1
[DE81-027536] N82-13526

FUNCTIONS (MATHEMATICS)
The least fixed point property for omega chain continuous functions N82-13787
Spectral functions in quantum chromodynamics and applications N82-13969

FURNACES
Pilot-scale development of a low-NOx coal-fired tangential system
[PB81-242513] N82-13270

FUSELAGES
Some RAE research on shielded and unshielded fuselage mounted air intakes at subsonic and supersonic speeds N82-13068
The influence of closed-coupled, rear fuselage mounted nacelles on the design of an advanced high speed wing N82-13092
Aerodynamic aspects of a high bypass ratio engine installation on a fuselage afterbody N82-13093

FUSION REACTORS
Materials studies for magnetic fusion energy applications at low temperatures -4
[PB81-222507] N82-13928

G

GALLIUM
Upper critical fields and span states in A-15 superconductors, part 1. Vortices in two-dimensional superconductors, part 2 N82-13942

GALLIUM ARSENIDES
Three-5 heterostructure avalanche photodiode modules for fiber optic communication links in the 1.0 to 1.3 micrometer spectral range
[AD-A099506] N82-13334
Raman probe of equilibrium and laser modulated populations of electrons and phonons in GaAs N82-13934
CW laser annealing and CW laser assisted diffusion in gallium arsenide N82-13943
The growth and carrier transport properties of sputter deposited GaAs thin films doped with silicon and magnesium N82-13965

GAMMA RAY SPECTROMETERS
Determination of radionuclide species by on-line radiochromatography using high resolution gamma ray spectroscopy N82-13181

GAMMA RAYS
Inclusive charged particle spectrum from the interaction of nuclei with intermediate energy proton N82-13848
Specific gamma-ray dose constants for nuclides important to dosimetry and radiological assessment
[DE81-031980] N82-13863
Gamma ray buildup factors in lead-iron and iron-lead shields
[EUR-7086-EN] N82-13864

GANGLIA
Neurotransmitter function in the basal ganglia after acute and chronic ethanol treatment
[AD-A103744] N82-13649

GAS ANALYSIS
Dynamic mass spectrometry: A residual gas analysis method and some applications
[DE81-026230] N82-13195

GAS CHROMATOGRAPHY
A miniature, thin-film thermal conductivity detector for an integrated gas chromatograph N82-13200
Gas-solid chromatography on cation forms of lightly sulfonated porous polymers N82-13237
Synthetic fuel aromaticity and staged combustion
[DE81-024205] N82-13246

GAS COMPOSITION
Observational data needs useful for modeling the coma N82-13991
Ground-based cometary spectroscopy N82-14007

GAS COOLED FAST REACTORS
Assessment of the computer code COBRA/CFTL --- for thermal-hydraulic analysis of simulated gas-cooled fast breeder reactor cores
[DE81-027933] N82-13771

GAS DENSITY
Gas target neutron generator studies
[UTIAS-251] N82-13850

GAS FLOW
Flow distribution control characteristics in marine gas turbine waste-heat recovery systems. Phase 1: Flow distribution characteristics and control in diffusers
[AD-A104560] N82-13390

GAS JETS
Two studies of fluidized beds: Heat transfer and grid jets N82-13203

GAS PRESSURE
On a dusty-gas shock tube
[UTIAS-250] N82-13151

GAS TRANSPORT
Transport properties of gaseous ions N82-13870
Oxygen transport and line emissions in a tokamak plasma
[IPPJ-544] N82-13900

GAS TURBINE ENGINES
Flow distribution control characteristics in marine gas turbine waste-heat recovery systems. Phase 1: Flow distribution characteristics and control in diffusers
[AD-A104560] N82-13390
Gas-turbine critical research and advanced technology support project
[NASA-TM-81708] N82-13509
Development of a high-temperature durable catalyst for use in catalytic combustors for advanced automotive gas turbine engines
[NASA-CR-165396] N82-13510

GAS TURBINES
Gas turbine combustor soot and radiation N82-13174
Update on Specified European R and D Efforts. Part 1: Appendices
[DE81-026404] N82-13983

GAS-METAL INTERACTIONS
Investigation into the role of NaCl deposited on oxide and metal substrates in the initiation of hot corrosion
[NASA-CR-165029] N82-13217
Development and optimization of hydrogen storage materials using surface analytical techniques
[BMVG-FBWT-80-6] N82-13546

GASEOUS DIFFUSION
Transport properties of gaseous ions N82-13870

GASES
Infiltration and indoor air quality in energy efficient houses in Eugene, Oregon
[DE82-000971] N82-13561
On the vibrational energy transfer processes of polyatomic molecules in the gas and solid phases N82-13865
Role of electron swarm studies in the development of gaseous dielectrics
[DE81-026349] N82-13952

GATES (CIRCUITS)
Effect of gate oxide thickness on the radiation hardness of silicon-gate CMOS
[DE81-027202] N82-13366

GAUSS EQUATION
Intermediate band surface photometry of elliptical galaxies N82-14035

GENERAL AVIATION AIRCRAFT
NASA research in aircraft propulsion
[NASA-TM-82771] N82-13146

GENERATION
Mesh generating and plotting facilities of the LAMCAL program
[EUR-7099-EN] N82-13778

GEOCHEMISTRY
Alaska's Water resources problems and research needs: Institute of Water Resources, five-year research plan
[PB81-231920] N82-13477
Petrology and geochemistry of ophiolite fragments in a tectonic melange, Kodiak Islands, Alaska N82-13610
Catalog of lunar mare basalts greater than 40 grams. Part 1: Major and trace chemistry, with megascopic descriptions and rock and thin section photographs
[NASA-TM-84065] N82-14040

GEOCHRONOLOGY
Development of peatlands in northern Minnesota
[DE82-000873] N82-13475

GEOCORONAL EMISSIONS
Temperature and density of geocoronal helium derived from a rocket-borne He resonance cell experiment
[BMFT-FB-W-80-015] N82-13605

GEODESIC LINES
Curvature singularities in certain space-times N82-13824

GEODESY
Reports of Planetary Geology Program, 1981
[NASA-TM-84211] N82-14041

GEODETIC SURVEYS
Report of survey for McDonald Observatory, Harvard Radio Astronomy Station, and vicinity
[PB81-234338] N82-13606

GEOLOGICAL FAULTS
Recurrence intervals and recency of faulting along the San Gregorio fault zone, San Mateo County, California N82-13581
Plastic flow and unstable deformation of geological materials N82-13587
Papers presented to the Conference on the Processes of Planetary Rifting
[LPI-CONTRIB-457] N82-13595
Studies of natural fractures, fault zone permeability, and a pore space-permeability model N82-13616

GEOLOGY
A depositional model for major coal seams in the Rock Springs Formation, Upper Cretaceous, southwest Wyoming N82-13580

GEOMETRIC RECTIFICATION (IMAGERY)
Symbolic reasoning among 3-D models and 2-D images N82-13761

GEOMETRICAL OPTICS
Possibilities of phase correction on the small reflector in a two-reflector antenna N82-13322
Optics of mass separator 1
[DE81-028242] N82-13886

GEOMORPHOLOGY
Basement rocks of the main interior basins of the midcontinent
[NASA-CR-164935] N82-13596

GEOPHYSICAL OBSERVATORIES
Geophysical monitoring for climatic change, number 8: Summary Report, 1979
[PB81-233355] N82-13631

GEOPHYSICS
Solar-geophysical data. Prompt report, part 1
[PB81-221178] N82-14044
Solar-geophysical data. Comprehensive reports, part 2
[PB81-221186] N82-14045
Solar-geophysical data. Explanation of data reports
[PB81-221194] N82-14046

GEORGIA
Analysis of the development of shallow groundwater supplies by pumping from ponds
[PB81-231904] N82-13476

GEOSYNCHRONOUS ORBITS
Technical basis for efficient management of geostationary satellite orbit/spectrum N82-13159

GEOTECHNICAL ENGINEERING
Evaluation of reef shell embankment
[PB81-232761] N82-13266

GEOTHERMAL ENERGY CONVERSION
Workshop proceedings: U-bend tube cracking in steam generators
[DE81-903765] N82-13515
New and renewable energy in the United States of America
[DE81-030887] N82-13539

GEOTHERMAL ENERGY UTILIZATION
Feasibility study report for the Imperial Valley Ethanol Refinery: A 14.9-million-gallon-per-year ethanol synfuel refinery utilizing geothermal energy
[DE82-000288] N82-13252
Program planner's guide to geothermal development in California
[DE82-000700] N82-13527

GEOTHERMAL RESOURCES
Feasibility study report for the Imperial Valley Ethanol Refinery: A 14.9-million-gallon-per-year ethanol synfuel refinery utilizing geothermal energy
[DE82-000288] N82-13252
Geothermal-resource verification for Air Force Bases
[DE81-027482] N82-13520

GERMANIUM
Critically evaluated data on optical and transport properties of solids (refractive index and absorption coefficient of selected optical materials)
[AD-A105059] N82-13879
Phase separation of a two component electron-hole liquid in (111) stressed Ge N82-13938

GIANT STARS
Evolution of close binary systems: Observational aspects
[NASA-CR-165039] N82-14027

GLASS
Surface failure of CO2 laser irradiated glass
[AD-A105454] N82-13421
Electric field-enhanced diffusion and electron stimulated desorption of alkali elements from glass surfaces during electron bombardment and Auger electron analysis N82-13961

GLAZES
Field tests of a surface ice accretion measurement system
[AD-A100282] N82-13624

GLOBAL AIR SAMPLING PROGRAM
An automated system for global atmospheric sampling using B-747 airliners
[NASA-CR-165264] N82-13554

GOGGLES
Minimum/constant voltage PLZT electrooptic shutters --- lead lanthanum zirconate titanate wafers for flash protective goggles
[DE81-028646] N82-13888

GOVERNMENTS
Building a consensus about energy technologies
[DE82-000501] N82-13536

GRAIN BOUNDARIES
Fundamental studies of grain-boundary passivation in polycrystalline silicon with application to improved photovoltaic devices
[DE82-000825] N82-13956
The structure and properties of grain boundaries N82-13962

GRAMMARS
Preliminary analysis of a breadth-first parsing algorithm: Theoretical and experimental results
[AD-A101852] N82-13797

GRANULAR MATERIALS
Plastic flow and unstable deformation of geological materials N82-13587

GRAPHITE
Physical adsorption of quantum atomic and molecular systems N82-13846

GRAPHITE-EPOXY COMPOSITE MATERIALS
Effects of hygrothermal conditioning on the dynamic behavior of resin matrix composites N82-13172
Creep and creep rupture of laminated graphite/epoxy composites N82-13173

GRATINGS (SPECTRA)
Synthesis of nonequidistant line-source antenna by the statistical methods of search N82-13329

GRAVIMETRY
Progress in the global standarization of gravity: An analysis of the Woollard and Rose international gravity values
[AD-A099459] N82-13599

GRAVITATION
Problems in quantum mechanics and gravitation N82-13970

GRAVITATIONAL EFFECTS
Adaptation of the TH Epsilon Mu formalism for the analysis of the equivalence principle in the presence of the weak and electroweak interaction
[NASA-TM-82450] N82-13851

GRAVITATIONAL FIELDS
Simulation studies on the computation of the gravity vector in space from surface data considering the topography of the Earth N82-13612

GRAVITY ANOMALIES
Regularized integration of gravity-perturbed trajectories: A numerical efficiency study N82-13155
Progress in the global standarization of gravity: An analysis of the Woollard and Rose international gravity values
[AD-A099459] N82-13599

GRAZING INCIDENCE
The relationship between the acoustic impedance and unsteady flow field near the orifice of a two dimensional Helmholtz resonator in grazing flow N82-13378

GREAT LAKES (NORTH AMERICA)
Method for measuring brash ice thickness with impulse radar
[AD-A103738] N82-13597

GREEN FUNCTION
Simulation studies on the computation of the gravity vector in space from surface data considering the topography of the Earth N82-13612

GROUND STATE
Trapped ion research
[AD-A098648] N82-13188

GROUND STATIONS
Correlated ground-based and the observations N82-14008

GROUND WATER
The occurrence and control of land subsidence due to ground water withdrawal with special reference to the San Joaquin and Santa Clara Valleys, California N82-13466
Analysis of the development of shallow groundwater supplies by pumping from ponds
[PB81-231904] N82-13476
Five-year Hawaii water research agenda, 1982-1987
[PB81-231912] N82-13478
Massachusetts' five-year water resources research needs, 1982-1987
[PB81-231961] N82-13480
Preliminary investigation of a shallow ground-water flow system associated with Connetquot Brook, Long Island, New York
[PB81-228751] N82-13481
The District of Columbia Five-Year Water Resources Research Program Plan, 1982-1987
[PB81-234882] N82-13482

Environmental and radiological safety studies: Interaction of (238) PuO2 heat sources with terrestrial and aquatic environments
[DE81-032019] N82-13565

GROUND WIND
Network wind power over the Pacific northwest. Appendix 1: Wind statistics summaries for the wind power data stations
[DE81-029291] N82-13518
Wind Power: Research on network wind power over the Pacific northwest. Executive summary
[DE81-029360] N82-13519
Application of Bayesian analysis for wind energy site evaluation N82-13619

GROUT
Effective stress-strain-strength behavior of silicate-grouted sand N82-13257
Injection and distribution of silicate grout in sand N82-13287

GRUNEISEN CONSTANT
Shock anomaly and s-d transition in high-pressure lanthanum
[DE81-027659] N82-13948

GUIDE VANES
Transonic flows in an air inlet with large incidence and the effect of a blowing trap N82-13071

GUNFIRE
Electronic measurement of airblast overpressure
[AD-A105379] N82-13389

GUST ALLEVIATORS
Design for active and passive flutter suppression and gust alleviation
[NASA-CR-3482] N82-13147

GYROSCOPIC COUPLING
Satellite attitude control with decomposed controller
[LOG-G668] N82-13160

H

HADRONS
The hadronic decay rate of the Higgs boson: An application of the running mass N82-13842
Two-photon physics as a probe of hadron dynamics
[DE81-028757] N82-13858

HALIDES
Critically evaluated data on optical and transport properties of solids (refractive index and absorption coefficient of selected optical materials)
[AD-A105059] N82-13879

HALL EFFECT
Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-field
[NASA-TM-82750] N82-13908
Boron implanted strontium titanate N82-13939
Fundamental studies of grain-boundary passivation in polycrystalline silicon with application to improved photovoltaic devices
[DE82-000825] N82-13956

HALLEY'S COMET
Photographic observations of comets at Lowell Observatory --- Halley's comet N82-14016
Outburst and nuclear breakup of Comet Halley - 1910 N82-14018
The interactive astronomical data analysis facility - image enhancement techniques to Comet Halley N82-14019
Near perihelion observations of Comet Halley from Shuttle orbiter N82-14021
The ESA mission to Comet Halley N82-14025
The International Halley Watch: A program of coordination, cooperation and advocacy N82-14026

HALOCARBONS
Metabolism summaries of selected halogenated organic compounds in human and environmental media, a literature survey: First update
[PB81-232811] N82-13655

HALOGEN COMPOUNDS
Metabolism summaries of selected halogenated organic compounds in human and environmental media, a literature survey: First update
[PB81-232811] N82-13655

HALOGENS
Flammability and photo-stability of selected polymer systems N82-13236

HALOS
On observing comets for nuclear rotation N82-14015

HANDICAPS
A data collection scheme for identification of parameters in a driver model N82-13696

HARDENING (MATERIALS)
Laser heat treatment of track components in combat vehicles, phase 1
[AD-A102761] N82-13219

HARDNESS TESTS
Test number 2 of propellants for rocket motor E573
[FOA-C-20411-D1] N82-13254

HARDWARE
Descriptive techniques for digital system containing complex hardware components N82-13754

HARMONIC ANALYSIS
Electromagnetic cyclotron harmonic waves --- plasma heating
[IPPJ-536] N82-13903

HARMONIC EXCITATION
Structural dynamics: Modified calculations --- natural and harmonically excited vibrations of modified structures; increased computation efficiency
[BMVG-FBWT-81-1] N82-13457
Theory and calculation of Raman line shapes and excitation profiles near a one photon resonance N82-13866

HARMONIC GENERATIONS
Nonlinear optical effects in liquid crystals N82-13937

HARMONIC OSCILLATORS
Solution of initial-value problems for some infinite eventually periodic chains of harmonic oscillators N82-13807

HARMONIC RADIATION
Electromagnetic cyclotron harmonic waves --- plasma heating
[IPPJ-536] N82-13903

HARMONICS
AC harmonic filtering using controlled current injection N82-13348

HARRIER AIRCRAFT
A real time Pegasus propulsion system model for VSTOL piloted simulation evaluation
[NASA-TM-82770] N82-13144

HAULING
Environmental impacts of energy transportation
[DE82-900316] N82-13559

HAWAII
Five-year Hawaii water research agenda, 1982-1987
[PB81-231912] N82-13478
The crustal structure of Kilauea and Mauna Loa volcanoes, Hawaii, from seismic refraction and gravity data N82-13583
Hawaii Mesoscale Energy and Climate project (HAMEC). 3: Atmospheric aerosol and cloud microphysics measurements
[PB81-231482] N82-13633

HAZARDS
Environmental assessment of the Alaskan Continental Shelf: Annual reports of principal investigators for the year ending March 1980. Volume 5: Hazards
[PB81-225732] N82-13607

HEAD MOVEMENT
A comparison of head and manual control for a position-control pursuit tracking task N82-13720

HEAD-UP DISPLAYS
Head up displays N82-13052

HEALTH PHYSICS
Health and safety research division
[DE81-026088] N82-13652

HEAT BUDGET
The nitrogen cycle and heat budget of a subtropical lagoon, Devils Hole, Harrington Sound, Bermuda: Implications for nitrous oxide production and consumption in marine environments N82-13611

HEAT EXCHANGERS
Mitigation of biofouling using coatings
[DE81-027900] N82-13647

HEAT FLUX
H-Coal product physical properties measurement
[DE81-029095] N82-13245
Compensation for use of monthly-averaged winds in numerical modeling
[NASA-TM-83855] N82-13623

HEAT OF COMBUSTION
Gas turbine combustor soot and radiation N82-13174

HEAT PIPES
Application of a gravity-driven wickless heat pipe for ice production in a cold energy storage system N82-13377
Heat pipe startup from the supercritical state N82-13400

HEAT RESISTANT ALLOYS
An investigation of notch low cycle fatigue life behavior of Rene' 80 at high temperature N82-13214
Aerodynamic heating on the corrugated surface of a 10.2 deg half-angle blunted cone at Mach 6.7
[NASA-TP-1928] N82-13383

HEAT STORAGE
Solar thermal energy systems
[DE81-029295] N82-13531

HEAT TRANSFER
Two studies of fluidized beds: Heat transfer and grid jets N82-13203
Electric coheating experiment to determine the heat-loss coefficient of a double-envelope house
[DE81-027937] N82-13264
Flow distribution control characteristics in marine gas turbine waste-heat recovery systems. Phase 1: Flow distribution characteristics and control in diffusers
[AD-A104560] N82-13390
Simultaneous heat and mass transfer in a porous medium N82-13404
Turbulent transfers in the atmospheric surface layer under varied stability conditions. A laboratory study N82-13586

HEAT TRANSFER COEFFICIENTS
Electric coheating experiment to determine the heat-loss coefficient of a double-envelope house
[DE81-027937] N82-13264
An experimental study of heat transfer to a horizontal tube in a large particle fluidized bed at elevated temperature N82-13406

HEAT TREATMENT
Laser heat treatment of track components in combat vehicles, phase 1
[AD-A102761] N82-13219
Electron Beam-Induced Current (EBIC) measurements of heat treated polycrystalline cuprous sulfide/cadimum sulfide solar cells N82-13552

HEATING EQUIPMENT
Workshop proceedings: U-bend tube cracking in steam generators
[DE81-903765] N82-13515
Passive/hybrid solar components: An approach to standard thermal test methods
[PB81-227886] N82-13549

HEAVY IONS
Measurements of heavy ions in the low altitude regions of the outer zone
[AD-A099453] N82-13600

HELICAL INDUCERS
Enhanced-confinement class of stellarators
[DE81-028727] N82-13924

HELICOPTER DESIGN
How the helicopter cockpit designer uses digital avionics N82-13049
Integration of controls and displays in US Army helicopter cockpits N82-13053

HELICOPTER PERFORMANCE
System identification helicopter parameters. Determination from flight tests, phase 2
[BMVG-FBWT-80-12] N82-13137

HELICOPTERS
Monocular vision and tactical flight on the helicopter N82-13059
Experimental investigation of a helmet mounted sight/display for helicopter N82-13060
Helicopter reliability and maintainability trends during development and production
[AD-A105775] N82-13136

HELIOSTATS
Solar thermal energy systems
[DE81-029295] N82-13531

HELIUM
Effect of low-temperature irradiation with (n, alpha) helium production on tensile properties of 12 Cr-1 Mo VW-type steels
[DE81-028578] N82-13222
Temperature and density of geocoronal helium derived from a rocket-borne He resonance cell experiment
[BMFT-FB-W-80-015] N82-13605
Helium diffusion in irradiated boron carbide
[DE81-027848] N82-13951

HELIUM ISOTOPES
Physical adsorption of quantum atomic and molecular systems N82-13846
HELMET MOUNTED DISPLAYS
Head up displays N82-13052
Experimental investigation of a helmet mounted sight/display for helicopter N82-13060
Use of a helmet-mounted matrix display for presenting energy-maneuverability information during simulated close combat N82-13061
HELMHOLTZ RESONATORS
The relationship between the acoustic impedance and unsteady flow field near the orifice of a two dimensional Helmholtz resonator in grazing flow N82-13378
HERMETIC SEALS
Magnetically undetectable electronic circuit assemblies
[AD-A100669] N82-13358
HETEROGENEITY
A statistical analysis of irregular quasi-optical lines (beam guides) with the aid of computer(s) N82-13324
HEURISTIC METHODS
Computer vision
[NASA-CR-165012] N82-13768
HIERARCHIES
Automated partitioning of hierarchically specified digital systems N82-13752
HIGH ENERGY INTERACTIONS
Study of the neutron-proton interaction in the 300-700 MeV energy region
[DE81-026733] N82-13859
HIGH FLUX ISOTOPE REACTORS
Effect of low-temperature irradiation with (n, alpha) helium production on tensile properties of 12 Cr-1 Mo VW-type steels
[DE81-028578] N82-13222
HIGH FREQUENCIES
Statistical energy analysis computer program, user's guide
[NASA-CR-161913] N82-13764
HIGH PASS FILTERS
The influence of pressure waves on measurements of high speed train noise --- high pass filtering of pressure waves
[DFVLR-FB-81-06] N82-13837
HIGH POWER LASERS
Large volume multiple-path nuclear pumped laser
[NASA-CASE-LAR-12592-1] N82-13415
Impedance-match experiments using high intensity lasers
[DE81-025802] N82-13422
Impedance-matching experiments using high-pressure, laser-driven shock waves
[DE81-028732] N82-13423
Simplified extension of the LSI-11 Q-Bus for a high energy laser control application
[DE81-027001] N82-13424
HIGH PRESSURE
High-pressure shrouded water sprays for dust control
[PB81-231458] N82-13483
Electron band theory and high pressure equation of state
[DE81-027436] N82-13955
HIGH RESOLUTION
A possible technique for cometary studies with high angular and spectral resolution N82-14012
HIGH STRENGTH ALLOYS
An improved stress corrosion test medium for aluminum alloys
[NASA-TM-82452] N82-13216
HIGH TEMPERATURE
Energetics and dynamics of droplet evaporation in high temperature intermediate Reynolds number flows N82-13379
An experimental study of heat transfer to a horizontal tube in a large particle fluidized bed at elevated temperature N82-13406
The influence of high temperature on braking --- wheel brakes N82-13433
HIGH TEMPERATURE ENVIRONMENTS
Rate coefficients of combustion/fuel conversion reactions by high-temperature photochemistry
[DE81-027965] N82-13192
HIGH TEMPERATURE FLUIDS
Stress corrosion cracking of type 304 stainless steel in high temperature dilute chloride solution N82-13228
HIGH TEMPERATURE GAS COOLED REACTORS
High-temperature gas-cooled reactor technology development program
[DE81-029096] N82-13871
HIGH TEMPERATURE PLASMAS
Electromagnetic cyclotron harmonic waves --- plasma heating
[IPPJ-536] N82-13903
Brief survey of experimental investigation of instabilities in microwave-heated plasmas N82-13912
Hot-electron ring stability at the University of Tennessee N82-13914
Stability of hot electron plasma in the ELMO bumpy torus N82-13917
HIGH TEMPERATURE TESTS
High-temperature measurements of alkali levels in an experimental 6-inch AFBC
[DE81-023632] N82-13193
HIGH VOLTAGES
Camelot: A novel concept for a multiterawatt pulse power generator for single pulse burst or repetition rate operation
[AD-A103024] N82-13513
HIGHWAYS
Construction of a recycled Portland cement concrete pavement --- Connecticut expressway
[PB81-233553] N82-13267
HISTORIES
ICAPS oceanographic data for the Indian Ocean
[AD-A103173] N82-13641
HOLES (ELECTRON DEFICIENCIES)
Phase separation of a two component electron-hole liquid in (111) stressed Ge N82-13938
HOMOGENEITY
Composition dependence of neodymium optical homogeneous linewidths in glasses N82-13945
HOMOLOGY
Steenrod operations in spectral cohomology theories
[CTH-MATH-1981-06] N82-13802
HOMOTOPY THEORY
Steenrod operations in spectral cohomology theories
[CTH-MATH-1981-06] N82-13802
HONEYCOMB STRUCTURES
Development of a high-temperature durable catalyst for use in catalytic combustors for advanced automotive gas turbine engines
[NASA-CR-165396] N82-13510
HORN ANTENNAS
Two-mirror antenna for radio relay communication N82-13308
Use of principle of regularization in direct and mixed problems of the theory of the synthesis of radiating systems N82-13309
Synthesis of a plane system of discrete emitters N82-13310
HOT CORROSION
Investigation into the role of NaCl deposited on oxide and metal substrates in the initiation of hot corrosion
[NASA-CR-165029] N82-13217
Gas-turbine critical research and advanced technology support project
[NASA-TM-81708] N82-13509
HOT ELECTRONS
Enhanced energy deposition symmetry by hot electron transport
[DE81-028774] N82-13861
Kinetic stability analyses in a bumpy cylinder N82-13921
HOT STARS
An investigation of warm carbon stars N82-14033
HOT SURFACES
Development and testing of dry chemicals in advanced extinguishing systems for jet engine nacelle fires
[NASA-CR-165011] N82-13186
HUGONIOT EQUATION OF STATE
Properties of matter at ultra-high pressures
[DE81-026504] N82-13190
HUMAN BEHAVIOR
A theory of human error N82-13716
HUMAN BODY
A digital TV system for the detection of high speed human motion N82-13289
The measurements of fluid shifts and of the tissue compliance along body axis in man
[BMFT-FB-W-80-011] N82-13654
HUMAN FACTORS ENGINEERING
Color CRT displays for the cockpit N82-13051
Using voice control onboard combat aircraft N82-13056
Monocular vision and tactical flight on the helicopter N82-13059
Experimental investigation of a helmet mounted sight/display for helicopter N82-13060
Tanker avionics and aircrew complement evaluation N82-13063
F/A 18 Hornet crew station N82-13064
Raven aircraft filter-absorber --- agricultural aircraft
[AD-A098962] N82-13139
Testing of a work bench for handling of explosives in the laboratory
[FOA-C-20393-D1] N82-13397
Determination of efficient methods of lift by comparing trained and untrained male and female lifters
[AD-A100349] N82-13650
Linguistic and human performance considerations in the design of an anticipatory communication aid N82-13657
An investigation into pilot and system response to critical in-flight events, volume 1
[NASA-CR-166243-VOL-1] N82-13662
An investigation into pilot and system response to critical in-flight events, volume 2
[NASA-CR-166243-VOL-2] N82-13663
Visual/motion cue mismatch in a coordinated roll maneuver
[NASA-CR-166259] N82-13664
Supervisory control of remote manipulation: A preliminary evaluation N82-13675
Design and development of a six degree of freedom hand controller N82-13706
Human supervision and microprocessor control of an optical tracking system N82-13715
A model for the control mode man-computer interface dialogue N82-13722
Taxonomy of the human factors in man machine systems N82-13726
An information processing model for predicting error detection and correction: An analysis of operator performance
[AD-A105079] N82-13733
Dynamic decision-making in multi-task environments: Theory and experimental results
[AD-A102055] N82-13740
HUMAN PERFORMANCE
Linguistic and human performance considerations in the design of an anticipatory communication aid N82-13657
The influence of motion cues on driver-vehicle performance in a simulator N82-13681
Multiple man-machine interfaces N82-13682
A model of the human observer and decision maker N82-13714
Dynamic decision-making in multi-task environments: Theory and experimental results
[AD-A102055] N82-13740
HUMAN REACTIONS
Load compensating reactions to perturbations at wrist joint in normal man N82-13708
HUMIDITY
Mechanisms by which humidity alters ductility
[AD-A105530] N82-13221
HURRICANES
Some mean characteristics of Central North Pacific tropical cyclones
[PB81-230492] N82-13634
Annual data and verification tabulation, eastern North Pacific tropical storms and hurricanes 1980
[PB81-230336] N82-13636
HYBRID CIRCUITS
Magnetically undetectable electronic circuit assemblies
[AD-A100669] N82-13358
HYBRID COMPUTERS
Development report: Automatic System Test and Calibration (ASTAC) equipment
[NASA-CR-165403] N82-13505
HYDRATION
Micromechanics of expansive mechanisms in expansive cement concretes N82-13258
Development and optimization of hydrogen storage materials using surface analytical techniques
[BMVG-FBWT-80-6] N82-13546
HYDRAULIC EQUIPMENT
Fatigue test machines N82-13277

Variable amplitude fatigue testing N82-13278

HYDRIDES
Preparation and characterization of hydrogenated amorphous silicon
[DE81-030973] N82-13197

HYDROCARBON COMBUSTION
Control of hydrocarbons and carbon monoxide via catalytic incineration
[DE82-000508] N82-13560

HYDROCARBON FUELS
Development and testing of dry chemicals in advanced extinguishing systems for jet engine nacelle fires
[NASA-CR-165011] N82-13186
Cyclic compression, combustion and expansion of a fuel and air mixture in a cylinder containing a catalyst
[PB81-232480] N82-13434
Gas-turbine critical research and advanced technology support project
[NASA-TM-81708] N82-13509

HYDROCARBONS
Pyrolytic characterization of the organic matter in selected coals and in the Devonian shales of southern West Virginia N82-13578

HYDRODYNAMICS
Electrostatic and hydrodynamic interactions of charged macromolecular systems N82-13242
Assessment of the computer code COBRA/CFTL --- for thermal-hydraulic analysis of simulated gas-cooled fast breeder reactor cores
[DE81-027933] N82-13771

HYDROELECTRIC POWER STATIONS
Assessment of rotor-bearing dynamics: A planning study for the utility industry
[DE82-900378] N82-13430

HYDROFLUORIC ACID
Interatomic potential energy hypersurfaces for molecules N82-13841

HYDROGEN
Solubilities of dissolved gases in sea water
[AD-A100675] N82-13189
Ultrasonic attenuation and velocity studies in the alpha-alpha' solid solution phases of the Nb-H system
[DE81-026618] N82-13836
Physical adsorption of quantum atomic and molecular systems N82-13846
Fundamental studies of grain-boundary passivation in polycrystalline silicon with application to improved photovoltaic devices
[DE82-000825] N82-13956

HYDROGEN BONDS
Infrared vibrational predissociation spectroscopy of small molecular clusters
[DE81-028648] N82-13687

HYDROGENATION
Surface characterization of dispersed supported metal catalysts using a 'time lapse' dynamic pulse technique N82-13177
Preparation and characterization of hydrogenated amorphous silicon
[DE81-030973] N82-13197

HYDROGEOLOGY
Alaska's Water resources problems and research needs: Institute of Water Resources, five-year research plan
[PB81-231920] N82-13477

HYDROLOGY
Preliminary investigation of a shallow ground-water flow system associated with Connetquot Brook, Long Island, New York
[PB81-228751] N82-13481

HYDROLOGY MODELS
Regional hydrologic models for climatology: An application to three Wisconsin watersheds N82-13467

HYDROPHONES
Theoretical analysis of the effects of turbulence on a mobile parametric receiver
[AD-A101418] N82-13833

HYGRAL PROPERTIES
A laboratory evaluation of modified asphalt
[PB81-231615] N82-13269

HYPERBOLIC DIFFERENTIAL EQUATIONS
A nonlinear conservation law with memory --- history boundary value problems in viscoelastic motion
[AD-A103882] N82-13791

HYPERBOLIC FUNCTIONS
A control canonical form for a class of linear hyperbolic systems N82-13786

HYPERSONIC FLOW
On a dusty-gas shock tube
[UTIAS-250] N82-13151

HYPERVELOCITY GUNS
Transitional ballistics of hypervelocity projectiles
[BMVG-FBWT-80-1] N82-13163

I

ICE
Investigation of the acoustic emission and deformation response of finite ice plates
[AD-A103731] N82-13471
Laboratory Research --- spectroscopic analysis, photochemical reactions, and proton irradiation of ice N82-14022

ICE FORMATION
Application of a gravity-driven wickless heat pipe for ice production in a cold energy storage system N82-13377
Field tests of a surface ice accretion measurement system
[AD-A100282] N82-13624

ICE NUCLEI
Environmental effects of pollutants from coal combustion. 1: The Four Corners Power Plant, Farmington, N.M.
[PB81-230427] N82-13572
Environmental effects of pollutants from coal combustion. 2: The Colstrip, Montana Power Plant
[PB81-234114] N82-13573
Field tests of a surface ice accretion measurement system
[AD-A100282] N82-13624
Hawaii Mesoscale Energy and Climate project (HAMEC). 3: Atmospheric aerosol and cloud microphysics measurements
[PB81-231482] N82-13633

ICE REPORTING
Field tests of a surface ice accretion measurement system
[AD-A100282] N82-13624

IMAGE CORRELATORS
Far infrared source classification system --- digital system
[ENST-E-80005] N82-13891

IMAGE ENHANCEMENT
Some experimental design techniques in image processing problems N82-13782
The interactive astronomical data analysis facility - image enhancement techniques to Comet Halley N82-14019

IMAGE PROCESSING
Structure of the knowledge base for an expert labeling system N82-13723
Multi-sensor image registration N82-13755
Some experimental design techniques in image processing problems N82-13782
Outburst and nuclear breakup of Comet Halley - 1910 N82-14018
The interactive astronomical data analysis facility - image enhancement techniques to Comet Halley N82-14019
Astronomical activities report
[ISSN-0531-4496] N82-14028

IMAGE RESOLUTION
Discrimination of hologram and antenna theory N82-13320
Video framerate, resolution and grayscale tradeoffs for undersea telemanipulator N82-13673

IMAGES
Symbolic reasoning among 3-D models and 2-D images N82-13761
Computer vision
[NASA-CR-165012] N82-13768

IMAGING TECHNIQUES
Head up displays N82-13052
Discrimination of hologram and antenna theory N82-13320
Imaging systems for fast electrophotographic processes
[BMFT-FB-T-80-183] N82-13411
Multi-sensor image registration N82-13755
Computer vision
[NASA-CR-165012] N82-13768

IMMUNOASSAY
Application of electrochemistry to biochemical problems --- immunoassay technique using differential pulse anodic stripping voltammetry N82-13179

IMPACT LOADS
Hydrodynamic computations of pressures generated by steam pipe rupture
[AD-A102046] N82-13449
Large amplitude compression and shear wave propagation in impact-loaded PMMA
[AD-A105953] N82-13450

IMPACT STRENGTH
Cyclic strain approach to fatigue in metals N82-13285

IMPACT TESTS
Properties of matter at ultra-high pressures
[DE81-026504] N82-13190
Evaluation of low-chlorine TATB from a production source
[DE81-025474] N82-13249
Cyclic strain approach to fatigue in metals N82-13285

IMPAIRMENT
Detecting human operator impairment with a psychomotor task N82-13718

IMPEDANCE MATCHING
Thin magnetic impedance antennas N82-13314
Impedance-match experiments using high intensity lasers
[DE81-025802] N82-13422
Impedance-matching experiments using high-pressure, laser-driven shock waves
[DE81-028732] N82-13423

IMPLOSIONS
Radiation-hydrodynamics of HII regions and molecular clouds
[DE81-028696] N82-14032

IMPULSES
Method for measuring brash ice thickness with impulse radar
[AD-A103738] N82-13597

IMPURITIES
Oxygen transport and line emissions in a tokamak plasma
[IPPJ-544] N82-13900

INCENTIVES
Building a consensus about energy technologies
[DE82-000501] N82-13536
Multiple man-machine interfaces N82-13682

INCIDENCE
Transonic flows in an air inlet with large incidence and the effect of a blowing trap N82-13071

INCINERATORS
Control of hydrocarbons and carbon monoxide via catalytic incineration
[DE82-000508] N82-13560

INCOMPRESSIBLE FLOW
An experimental investigation of the turbulent flow in the junction of a flat plate and a body of constant thickness N82-13102

INCONEL (TRADEMARK)
Workshop proceedings: Corrosion of Inconel 600 Steam Generator Tubing in the Tubesheet Crevice
[DE81-903554] N82-13226

INDEPENDENT VARIABLES
A quasi-Newton procedure for identifying pilot-related parameters of the optimal control model N82-13694
Two-D results on human operator perception N82-13697
A mixed variational principle for finite element analysis N82-13789

INDEXES (DOCUMENTATION)
Astronomical data bases and retrieval systems N82-14020

INDEXES (RATIOS)
Weighting of aptitude components based on differences in technical school difficulty
[AD-A102045] N82-13725

INDIAN OCEAN
ICAPS oceanographic data for the Indian Ocean
[AD-A103173] N82-13641

INDIUM PHOSPHIDES
Three-5 heterostructure avalanche photodiode modules for fiber optic communication links in the 1.0 to 1.3 micrometer spectral range
[AD-A099506] N82-13334

INDUCTANCE
Electron Beam-Induced Current (EBIC) measurements of heat treated polycrystalline cuprous sulfide/cadimum sulfide solar cells N82-13552

INDUSTRIAL ENERGY
Low/medium Btu coal gasification assessment program for potential users in New Jersey: Executive summary
[DE81-025475] N82-13247

INDUSTRIAL PLANTS
Residual-energy-applications program environmental analysis report --- industrial scale waste heat recovery equipment and utilization
[DE81-027538] N82-13525

INDUSTRIAL SAFETY
Testing of a work bench for handling of explosives in the laboratory
[FOA-C-20393-D1] N82-13397

INDUSTRIAL WASTES
Transport and reaction of heavy metals in Alaskan fjord estuaries
[DE81-028319] N82-13474

INDUSTRIES
Dynamic mass spectrometry: A residual gas analysis method and some applications
[DE81-026230] N82-13195

INELASTIC SCATTERING
Energy losses and mean free paths of electrons in silicon dioxide
[DE81-026353] N82-13860
Inelastic scattering of high energy muons from nuclear targets N82-13874

INELASTIC STRESS
Inelastic overload analysis of continuous steel multi-girder highway bridges by the finite-element method N82-13440

INEQUALITIES
On general 1 exp p summability methods
[CTH-MATH-1981-07] N82-13803

INERTIA
The propagation of inertial-internal waves in coastal upwelling regions N82-13645

INERTIAL FUSION (REACTOR)
Stability considerations for light-ion beam transport in Z discharge channels
[AD-A101426] N82-13852

INERTIAL REFERENCE SYSTEMS
Quantum frames of reference N82-13822

INFERENCE
Language, computation, and reality N82-13757

INFLECTION POINTS
Intermediate band surface photometry of elliptical galaxies N82-14035

INFORMATION DISSEMINATION
Massachusetts' five-year water resources research needs, 1982-1987
[PB81-231961] N82-13480
The International Halley Watch: A program of coordination, cooperation and advocacy N82-14026

INFORMATION FLOW
On the formal specification of computer communication protocols
[AD-A100189] N82-13738

INFORMATION MANAGEMENT
Information resources in the USA on new and renewable energy, a description and directory
[DE81-028867] N82-13522
Managing information technology change in the decade of the 80's
[AD-A099441] N82-13976

INFORMATION RETRIEVAL
Information storage in a decentralized computer system N82-13732
Query optimization by semantic reasoning N82-13762
PLOT2K: A graphics interface of system 2000
[DE81-028706] N82-13774
Astronomical data bases and retrieval systems N82-14020

INFORMATION THEORY
A model of the human observer and decision maker N82-13714

INFRARED ABSORPTION
Detection of trace gases using high resolution spectroscopy
[AD-A104841] N82-13883

INFRARED ASTRONOMY
Infrared experiments for spaceborne planetary atmospheres research. Full report
[NASA-TM-84414] N82-13876
Infrared experiments for spaceborne planetary atmospheres research. Executive summary
[NASA-TM-84413] N82-13877
Modern Observational Techniques for Comets --- conferences
[NASA-CR-165006] N82-13989
Astronomical data bases and retrieval systems N82-14020
Astronomical activities report
[ISSN-0531-4496] N82-14028

INFRARED DETECTORS
Far infrared source classification system --- digital system
[ENST-E-80005] N82-13891

INFRARED INSTRUMENTS
Infrared experiments for spaceborne planetary atmospheres research. Full report
[NASA-TM-84414] N82-13876
Infrared experiments for spaceborne planetary atmospheres research. Executive summary
[NASA-TM-84413] N82-13877

INFRARED RADIATION
Short-range communications using diffusely scattered infrared radiation N82-13344
Development of an infrared radiative heating model
[NASA-CR-166272] N82-13622

INFRARED RADIOMETERS
Millimeter wave radiometry as a means of determining cometary surface and subsurface temperature N82-14003

INFRARED SPECTROSCOPY
Infrared vibrational predissociation spectroscopy of small molecular clusters
[DE81-028648] N82-13887
Infrared observations of comets N82-14000
Infrared observations of faint comets N82-14001

INFRASONIC FREQUENCIES
Detection of infrasound generated by Clear Air Turbulence (CAT) N82-13830

INITIATORS (EXPLOSIVES)
Review of low-voltage CP detonators
[DE81-025837] N82-13250

INLET AIRFRAME CONFIGURATIONS
Aerodynamics of Power Plant Installation
[AGARD-CP-301] N82-13065
Performance of highly integrated inlets for supersonic aircraft N82-13066
Top-mounted inlet system feasibility for transonic-subsonic fighter aircraft applications N82-13067
Some RAE research on shielded and unshielded fuselage mounted air intakes at subsonic and supersonic speeds N82-13068
Prediction and measurement of time-variant, three-dimensional flows in military aircraft intakes N82-13069
Effects of intake geometry on circular pitot intake performance at zero and low forward speeds N82-13070
The design and development of the Tornado engine air intake N82-13074
A synthesis method for estimating maximum instantaneous inlet distortion based on measured inlet steady state and RMS pressures N82-13083
Final report on the FueFo-4 major theme: Interference drag with airframe/engine integration on fighter aircraft
[BMVG-FBWT-79-20] N82-13116

INLET FLOW
Prediction and measurement of time-variant, three-dimensional flows in military aircraft intakes N82-13069
Effects of intake geometry on circular pitot intake performance at zero and low forward speeds N82-13070
Subsonic military aircraft engine intake: An integrated theoretical experiment design N82-13073
The design and development of the Tornado engine air intake N82-13074
An acquisition and analysis system for dynamic tests of air inlets N82-13082
A synthesis method for estimating maximum instantaneous inlet distortion based on measured inlet steady state and RMS pressures N82-13083
Model testing techniques for measuring inlet drag N82-13084
Thrust modulation methods for a subsonic V/STOL aircraft
[NASA-TM-82747] N82-13112
Numerical analysis of the scramjet-inlet flow field by using two-dimensional Navier-Stokes equations
[NASA-TP-1940] N82-13142

INPUT
International seismological data center. Input data for an experimental data base
[FOA-C-20380-T1] N82-13604

INPUT/OUTPUT ROUTINES
Computational problems in autoregressive moving average (ARMA) models N82-13698

INSPECTION
Optical scanner system for internal inspection of steam-generator tubes
[EPRI-NP-1944] N82-13884

INSTALLATION MANUALS
Practical aspects of instrumentation system installation, volume 13
[NASA-TM-84067] N82-13140

INSTALLING
Wind tunnel test and analysis techniques using powered simulators for civil nacelle installation drag assessment N82-13088

INSTRUCTORS
Group 4: Instructor training and qualifications N82-13134

INSTRUMENT PACKAGES
Near perihelion observations of Comet Halley from Shuttle orbiter N82-14021

INSULATION
Study of the physics of insulating films as related to the reliability of metal-oxide semiconductor devices
[AD-A105030] N82-13359

INSULATORS
Conduction and charge storage in electron irradiated spacecraft insulators
[AD-A104796] N82-13167
Advanced indium antimonide monolithic charge coupled infrared imaging arrays
[NASA-CR-165799] N82-13356
Aging and corrosion problems with flat solar energy absorbers. Study based upon literature and experiment exchanges
[SP-RAPP-1979/4] N82-13548

INTEGRAL EQUATIONS
An integral equation method for cutout problems in shells N82-13459
A sharper estimate of the renewal function
[CTH-MATH-1980-18] N82-13798

INTEGRATED CIRCUITS
A miniature, thin-film thermal conductivity detector for an integrated gas chromatograph N82-13200
Further developments in integrated circuit assembling technology
[BMFT-FB-T-80-179] N82-13369
Introduction to the configurable highly parallel computer, revision
[AD-A099776] N82-13735

INTEGRATED ENERGY SYSTEMS
Distributed photovoltaic systems: Utility interface issues and their present status
[NASA-CR-165019] N82-13492

INTELSAT 5 SATELLITE
Launch mission summary: Intelsat 5 (F3) Atlas/Centaur-55
[NASA-TM-84068] N82-13161
Mission operation report: INTELSAT V-C(F-3)
[NASA-TM-84072] N82-13162

INTERATOMIC FORCES
Interatomic potential energy hypersurfaces for molecules N82-13841

INTERFACES
Practical aspects of instrumentation system installation, volume 13
[NASA-TM-84067] N82-13140
Interruption as a test of the user-computer interface N82-13721
A model for the control mode man-computer interface dialogue N82-13722

INTERFERENCE DRAG
Evaluation of an experimental technique to investigate the effects of the engine position on engine/pylon/wing interference N82-13090
The influence of closed-coupled, rear fuselage mounted nacelles on the design of an advanced high speed wing N82-13092

Aerodynamic aspects of a high bypass ratio engine installation on a fuselage afterbody N82-13093
Final report on the FueFo-4 major theme: Interference drag with airframe/engine integration on fighter aircraft
[BMVG-FBWT-79-20] N82-13116

INTERFERENCE LIFT
Evaluation of an experimental technique to investigate the effects of the engine position on engine/pylon/wing interference N82-13090

INTERFEROMETRY
Acoustical speckle interferometry and applications in experimental mechanics N82-13826

INTERMETALLICS
Development and optimization of hydrogen storage materials using surface analytical techniques
[BMVG-FBWT-80-6] N82-13546
Effects of pressure on the mixed valent properties of Ce and its intermetallic compounds
[DE81-028572] N82-13953
Defect structure and properties of intermetallic compound beta-LiAl N82-13959

INTERNAL COMBUSTION ENGINES
Barriers to the utilization of synthetic fuels for transportation
[NASA-CR-165517] N82-13243
Analysis of multicylinder IC-Engine crankshafts with hydrodynamic bearings using a finite element-transfer matrix approach N82-13437
Development of a high-temperature durable catalyst for use in catalytic combustors for advanced automotive gas turbine engines
[NASA-CR-165396] N82-13510
Determination of two-stroke engine exhaust noise by the method of characteristics
[NASA-TM-84061] N82-13827

INTERNAL WAVES
Surface signs of internal ocean dynamics
[AD-A101380] N82-13642
The propagation of inertial-internal waves in coastal upwelling regions N82-13645

INTERNATIONAL COOPERATION
The International Halley Watch: A program of coordination, cooperation and advocacy N82-14026

INTERPLANETARY MAGNETIC FIELDS
Magnetic clouds between 2-4 AU: Voyager observations
[NASA-TM-83849] N82-13593
Large-scale variations of the interplanetary magnetic field: Voyager 1 and 2 observations between 1-5 AU
[NASA-TM-83850] N82-13594

INTERPLANETARY MEDIUM
New problems of cometary observations from space N82-13994
Existing cometary data and future needs N82-14017

INTERPOLATION
Interpolating for the location of remote sensor data
[NASA-TM-82169] N82-13469

INTERPROCESSOR COMMUNICATION
A specification and proof technique for message-based systems and its application to distributed database algorithms N82-13756
Complexity of communication among asynchronous parallel processes N82-13760

INTERRUPTION
Interruption as a test of the user-computer interface N82-13721

INTERVALS
Recurrence intervals and recency of faulting along the San Gregorio fault zone, San Mateo County, California N82-13581

INTOXICATION
Detecting human operator impairment with a psychomotor task N82-13718

INTRAMOLECULAR STRUCTURES
Infrared vibrational predissociation spectroscopy of small molecular clusters
[DE81-028648] N82-13887

INVERTERS
The ac propulsion system for an electric vehicle, phase 1
[NASA-CR-165480] N82-13506

INVESTMENTS
A new approach to modeling the cost of ownership for aircraft systems
[AD-A104434] N82-13979

INVISCID FLOW
Calculation of transonic air-intakes using a computer package for inviscid and boundary layer flows N82-13072
Aerodynamic aspects of a high bypass ratio engine installation on a fuselage afterbody N82-13093
A numerical method for studying nacelle-jet-airfoil interaction in inviscid three-dimensional flow N82-13094
Technical evaluation report on the Fluid Dynamics Panel Symposium on Computation of Viscous-Inviscid Interactions
[AGARD-AR-171] N82-13384
Underexpanded free jets and their interaction with adjacent surfaces
[LOG-J12276] N82-13385
Computation of unsteady two-dimensional inviscid flow in turbomachinery cascades N82-13401

IODINE
Solubilities in multicomponent systems of nonspecific interactions N82-13205

ION BEAMS
Stability considerations for light-ion beam transport in Z discharge channels
[AD-A101426] N82-13852
Optics of mass separator 1
[DE81-028242] N82-13886

ION CURRENTS
Conductivity and permittivity measurements of fast ion conductors in the microwave region N82-13351

ION EXCHANGE MEMBRANE ELECTROLYTES
Conductivity and permittivity measurements of fast ion conductors in the microwave region N82-13351

ION EXCHANGE RESINS
Salt removal from brackish water by continuous processes with amphoteric, thermally regenerable ion-exchange resins N82-13202

ION EXCHANGING
Separations Science data base: An abstractor's manual
[DE81-029101] N82-13977

ION IMPLANTATION
Preliminary evaluation of ion implantation as a surface treatment to reduce wear of tool bits
[AD-A105053] N82-13261
Boron implanted strontium titanate N82-13939
CW laser annealing and CW laser assisted diffusion in gallium arsenide N82-13943

ION SCATTERING
Schwinger's variational principle for electron-ion scattering N82-13844

ION STRIPPING
Measurements of heavy ions in the low altitude regions of the outer zone
[AD-A099453] N82-13600

ION TRAPS (INSTRUMENTATION)
Trapped ion research
[AD-A098648] N82-13188

IONIC DIFFUSION
Transport properties of gaseous ions N82-13870

IONIC MOBILITY
Stability considerations for light-ion beam transport in Z discharge channels
[AD-A101426] N82-13852
A stochastic Langevin dynamics study of correlated ionic motion in one-dimensonal framework solid electrolytes N82-13966

IONIC REACTIONS
Mechanistic studies of electron exchange kinetics using ab initio
[DE81-026096] N82-13856

IONIZATION
Analytical detection of organic species by means of laser-induced multiphoton ionization N82-13646
Outer-shell excitation in sputtered atoms N82-13839

IONIZATION POTENTIALS
Mechanistic studies of electron exchange kinetics using ab initio
[DE81-026096] N82-13856
A correlated treatment of bound-continuum transitions within the electron propagator formalism N82-13869

IONIZED GASES
Gas target neutron generator studies
[UTIAS-251] N82-13850
Transport properties of gaseous ions N82-13870

IONIZING RADIATION
Data on the backscattering coefficients of light ions from solids
[IPPJ-AM-18] N82-13907

IONOSPHERIC COMPOSITION
JASPIC-DIP: The digital impedance probe in the JASPIC project
[BMFT-FB-W-80-034] N82-13169

IONOSPHERIC PROPAGATION
Ionospheric scintillation N82-13585

IONS
Energy levels in and on an oxide film as measured by electrochemical methods
[AD-A103704] N82-13187

IOWA
Five-year water resources research plan, 1982-1987
[PB81-231938] N82-13479

IRIDIUM
The chemical vapor deposition of iridium
[AD-A104582] N82-13360

IRON
Theoretical equations of state for metals
[DE81-028743] N82-13224
Double differential continuum neutron scattering cross sections in iron and nickel for incident energies of 7.5, 10 and 12 MeV N82-13847
Gamma ray buildup factors in lead-iron and iron-lead shields
[EUR-7086-EN] N82-13864

IRON OXIDES
Resonance Raman spectroscopic investigations of the active site structures of hemoglobin and hemerythrin N82-13176

IRRADIATION
Photon-electron correlation in the laboratory testing of electronic components. Part 2: Beam conditioning and diagnostics
[DE81-026606] N82-13365
Surface failure of CO2 laser irradiated glass
[AD-A105454] N82-13421
Gas target neutron generator studies
[UTIAS-251] N82-13850

ISOPROPYL COMPOUNDS
Effect of solvents on the radiation-induced polymerization of ethyl and isopropyl vinyl ethers N82-13238

ISOTHERMS
Shock anomaly and s-d transition in high-pressure lanthanum
[DE81-027659] N82-13948

ISOTOPIC LABELING
Investigations towards the understanding of surface treatment of propellant grains by means of trace elements
[BMVG-FBWT-79-14] N82-13253

ITERATION
Transforming contingency tables
[AD-A104182] N82-13821

IUE
Ultraviolet spectroscopy of comets using sounding rockets, IUE and Spacelab N82-14009
Evolution of close binary systems: Observational aspects
[NASA-CR-165039] N82-14027

J

JAMMING
Millimeter wave alternate route study
[AD-A102303] N82-13339
Camelot: A novel concept for a multiterawatt pulse power generator for single pulse burst or repetition rate operation
[AD-A103024] N82-13513

JAPANESE SPACE PROGRAM
Plans for Comet Halley --- ESA's Giotto mission, Japan's Planet-A mission, and the U.S.S.R. Venera-Halley mission N82-14024

JET AIRCRAFT
The influence of closed-coupled, rear fuselage mounted nacelles on the design of an advanced high speed wing N82-13092

JET ENGINES
Subsonic military aircraft engine intake: An integrated theoretical experiment design N82-13073
The design and development of the Tornado engine air intake N82-13074

Integration of advanced exhaust nozzles N82-13075

Development and testing of dry chemicals in advanced extinguishing systems for jet engine nacelle fires
[NASA-CR-165011] N82-13186

Dish stirling solar receiver combustor test program
[NASA-CR-165017] N82-13495

JET EXHAUST

Prediction of subsonic aircraft flows with jet exhaust interactions N82-13096

JET FLOW

Aerodynamics of an airfoil with a jet issuing from its surface N82-13121

Experimental and analytical investigation of a fluidic power generator
[JPL-PUB-81-100] N82-13386

Hydrodynamic computations of pressures generated by steam pipe rupture
[AD-A102046] N82-13449

JET IMPINGEMENT

Underexpanded free jets and their interaction with adjacent surfaces
[LOG-J12276] N82-13385

JET MIXING FLOW

Investigation of acoustic interactions in jet thrust augmenting ejectors
[AD-A106083] N82-13835

JET PROPULSION

Aerodynamics of an airfoil with a jet issuing from its surface N82-13121

JOINTS (ANATOMY)

Computational problems in autoregressive moving average (ARMA) models N82-13698

JOINTS (JUNCTIONS)

Effects of restrained thermal movement in a continuous, prestressed concrete bridge without interior expansion joints N82-13461

JOURNAL BEARINGS

Analysis of multicylinder IC-Engine crankshafts with hydrodynamic bearings using a finite element-transfer matrix approach N82-13437

K

KALMAN FILTERS

A contribution to robust detection and estimation N82-13809

KERR CELLS

Electrooptic shutter devices utilizing PLZT ceramic wafers
[DE81-025470] N82-13885

KERR ELECTROOPTICAL EFFECT

Electrooptic shutter devices utilizing PLZT ceramic wafers
[DE81-025470] N82-13885

KILOMETRIC WAVES

Planetary radio astronomy observations from Voyager-2 near Saturn
[NASA-TM-83856] N82-14037

Saturnian kilometric radiation: Source locations
[NASA-TM-83846] N82-14038

KINEMATICS

Numerical methods for the analysis of fluid-structure interaction problems N82-13381

Application of the theory of linear elastic materials with voids
[DE81-027903] N82-13452

Dynamic analysis of flexible spatial mechanisms and robotic manipulators N82-13460

KINETIC ENERGY

Eigenmode stability analysis for a bumpy torus N82-13915

KINETIC THEORY

The internal structure of the magnetopause
[AERONOMICA-ACTA-A-221-1980] N82-13589

On the vibrational energy transfer processes of polyatomic molecules in the gas and solid phases N82-13865

A comparative study of classical and quantal approaches to thermal and diffusive transport in a dilute atom-diatom binary mixture N82-13868

KINETICS

Rate coefficients of combustion/fuel conversion reactions by high-temperature photochemistry
[DE81-027965] N82-13192

Micromechanics of expansive mechanisms in expansive cement concretes N82-13258

KRAMERS-KRONIG FORMULA

Determination of optical constants from extinction measurements
[AD-A099494] N82-13882

KRYPTON

A study of the formation and structure of small clusters of noble gases and sulfur hexafluoride formed in Laval Nozzle molecular beams N82-13201

Coexistence of non-registered monolayer and bilayer solid films N82-13931

L

LABORATORY EQUIPMENT

Beyond mere automation
[AD-A103838] N82-13736

LAGOONS

The nitrogen cycle and heat budget of a subtropical lagoon, Devils Hole, Harrington Sound, Bermuda: Implications for nitrous oxide production and consumption in marine environments N82-13611

LAGRANGE COORDINATES

Lagrangian fluid dynamics using the Voronoi-Delaunay mesh
[LA-UR-81-1421] N82-13393

LAKE ICE

Method for measuring brash ice thickness with impulse radar
[AD-A103738] N82-13597

LAKES

Laboratory measurements of physical, chemical, and optical characteristics of Lake Chicot sediment waters
[NASA-TP-1941] N82-13468

Energy generation and the sulfur-carbon cycle
[DE81-030949] N82-13562

LAMELLA (METALLURGY)

A quantitative study of factors influencing lamellar eutectic morphology during solidification
[NASA-TM-82451] N82-13218

LAMINAR BOUNDARY LAYER

Calculation of transonic air-intakes using a computer package for inviscid and boundary layer flows N82-13072

LAMINAR FLOW

A numerical study of laminar unsteady compressible flow over airfoils N82-13099

An experimental study of Tollmien-Schlichting wave cancellation --- friction drag reduction N82-13120

LAMINATES

Materials studies for magnetic fusion energy applications at low temperatures -4
[PB81-222507] N82-13928

LAND MANAGEMENT

The occurrence and control of land subsidence due to ground water withdrawal with special reference to the San Joaquin and Santa Clara Valleys, California N82-13466

LANDAU DAMPING

Laser induced charge transfer collisions N82-13418

LANDING INSTRUMENTS

Predictor symbology in computer-generated perspective displays N82-13674

LANGEVIN FORMULA

A stochastic Langevin dynamics study of correlated ionic motion in one-dimensonal framework solid electrolytes N82-13966

LANGUAGE PROGRAMMING

Preliminary analysis of a breadth-first parsing algorithm: Theoretical and experimental results
[AD-A101852] N82-13797

LANTHANUM

Shock anomaly and s-d transition in high-pressure lanthanum
[DE81-027659] N82-13948

LANTHANUM COMPOUNDS

Minimum/constant voltage PLZT electrooptic shutters --- lead lanthanum zirconate titanate wafers for flash protective goggles
[DE81-028646] N82-13888

LARGE SCALE INTEGRATION

Simplified extension of the LSI-11 Q-Bus for a high energy laser control application
[DE81-027001] N82-13424

Future directions in Navy electronic system reliability and survivability
[AD-A102460] N82-13438

Application of computer voice input/output
[DE81-028769] N82-13743

LARGE SPACE STRUCTURES

Control design for parameter sensitivity reduction in linear regulators: Application to large flexible space structures N82-13158

Shape determination and control for large space structures
[JPL-PUB-81-71] N82-13166

On the modeling and control of flexible space structures N82-13168

LASER APPLICATIONS

Studies of photoionization in liquids using a laser two-photon ionization conductivity technique
[DE81-026514] N82-13194

Three laser experiments in gases N82-13416

Atomic pair processes and laser applications N82-13417

Laser induced charge transfer collisions N82-13418

Raman probe of equilibrium and laser modulated populations of electrons and phonons in GaAs N82-13934

LASER FUSION

Solution of single linear tridiagonal systems and vectorization of the ICOG algorithm on the Cray 1 --- laser fusion
[DE81-025461] N82-13773

Beam propagation in the frequency-converted subsystems of Nova and Novette
[DE81-028253] N82-13862

Fiber optic analog and timing monitoring system for the Antares laser fusion program
[DE81-028799] N82-13925

LASER OUTPUTS

Investigation of fluctuation phenomena in dye lasers N82-13419

Inverse cerenkov interaction between relativistic electrons and laser light N82-13425

LASER PUMPING

Large volume multiple-path nuclear pumped laser
[NASA-CASE-LAR-12592-1] N82-13415

LASER TARGET INTERACTIONS

Impedance-match experiments using high intensity lasers
[DE81-025802] N82-13422

Impedance-matching experiments using high-pressure, laser-driven shock waves
[DE81-028732] N82-13423

LATERAL CONTROL

Analysis of a longitudinal pilot-induced oscillation experienced on the approach and landing test of the space shuttle
[NASA-TM-81366] N82-13149

LATTICE VIBRATIONS

The structural and vibrational properties of amorphous and crystalline group V elements N82-13933

LAUNCH WINDOWS

Launch mission summary: Intelsat 5 (F3) Atlas/Centaur-55
[NASA-TM-84068] N82-13161

LAVAL NUMBER

A study of the formation and structure of small clusters of noble gases and sulfur hexafluoride formed in Laval Nozzle molecular beams N82-13201

LAW (JURISPRUDENCE)

Natural gas plan needed to provide greater protection for high-priority and critical uses
[PB81-228488] N82-13255

LAWS

Have we found Asymptopia: The ultimate form of physical laws?
[DE81-028853] N82-13825

LEAD (METAL)

Properties of matter at ultra-high pressures
[DE81-026504] N82-13190

The trace metal stratigraphy and recent sedimentary history of anthrogenous particulates on the San Pedro Shelf, California N82-13579

Gamma ray buildup factors in lead-iron and iron-lead shields
[EUR-7086-EN] N82-13864

LEAD OXIDES

Insoluble anodes for electrowinning zinc and other metals
[PB81-227365] N82-13227

LEAD TITANATES
Minimum/constant voltage PLZT electrooptic shutters --- lead lanthanum zirconate titanate wafers for flash protective goggles
[DE81-028646] N82-13888

LENS ANTENNAS
Method of the study of complex waveguide junctions with one or several regions of communication
N82-13316

LENSES
Phase measurments in the focal region of an aberrated lens N82-13875

LIBYA
Structural and stratigraphic analysis of the paleozoic Murzuk and Ghadames basins, western Libya
N82-13614

LIFE (DURABILITY)
Future directions in Navy electronic system reliability and survivability
[AD-A102460] N82-13438

LIFE CYCLE COSTS
A new approach to modeling the cost of ownership for aircraft systems
[AD-A104434] N82-13979

LIFE SCIENCES
Health and safety research division
[DE81-026088] N82-13652

LIFT
Determination of efficient methods of lift by comparing trained and untrained male and female lifters
[AD-A100349] N82-13650

LIGHT (VISIBLE RADIATION)
Thermal performance of windows having high solar transmittance
[DE81-028872] N82-13524

LIGHT ADAPTATION
Pupillometry, a bioengineering overview
N82-13711

LIGHT EMISSION
Atomic pair processes and laser applications
N82-13417

LIGHT IONS
Stability considerations for light-ion beam transport in Z discharge channels
[AD-A101426] N82-13852
Data on the backscattering coefficients of light ions from solids
[IPPJ-AM-18] N82-13907

LIGHT SCATTERING
Results to be expected from light scattering dust analyzer during a rendezvous mission N82-13999
The transfer of polarized radiation in spectral lines from rotationally distorted stars N82-14031

LIGHT TRANSMISSION
Experimental study of heterodyne photodetection. Perspectives for applications to optical transmission
[ENST-E-80013] N82-13892

LIGHTING EQUIPMENT
Appliance efficiency and the solar building
[DE81-029073] N82-13265

LIMB DARKENING
Submillimeter observations of solar limb-brightening in the total solar eclipse of 31 July 1981
N82-14043

LINE CURRENT
Synthesis of nonequidistant line-source antenna by the statistical methods of search N82-13329

LINE OF SIGHT
Experimental investigation of a helmet mounted sight/display for helicopter N82-13060

LINE SHAPE
Theory and calculation of Raman line shapes and excitation profiles near a one photon resonance
N82-13866
Computer programs for line shape analysis of X-ray diffraction peaks --- thin film analysis
[PB81-227787] N82-13958

LINE SPECTRA
Theory and calculation of Raman line shapes and excitation profiles near a one photon resonance
N82-13866
Oxygen transport and line emissions in a tokamak plasma
[IPPJ-544] N82-13900
Spectral imagery: Recent results with the SPIFI and their implications for cometary atmospheric studies --- servocontrolled polarimetric imaging Fabry-Perot interferometer N82-14011
The transfer of polarized radiation in spectral lines from rotationally distorted stars N82-14031

LINEAR ARRAYS
Antenna (selected articles)
[AD-A106523] N82-13304
Energy characteristics of periodic systems of radiators: Efficiency and output coefficient of power, directive gain, and gain factor N82-13306

LINEAR EQUATIONS
Solution of single linear tridiagonal systems and vectorization of the ICOG algorithm on the Cray 1 --- laser fusion
[DE81-025461] N82-13773

LINEAR FILTERS
Linear acousto-optic filtering with heterodyne and frequency-plane control N82-13352

LINEAR PROGRAMMING
Frequency sampling filters, design and applications
N82-13354

LINEAR RECEIVERS
Three-stage commutation field of the system of the repeated use of short-wave receiving antennas
N82-13317

LINEAR SYSTEMS
Control design for parameter sensitivity reduction in linear regulators: Application to large flexible space structures N82-13158
A control canonical form for a class of linear hyperbolic systems N82-13786

LINEARITY
Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-field
[NASA-TM-82750] N82-13908

LINGUISTICS
Linguistic and human performance considerations in the design of an anticipatory communication aid
N82-13657

LIQUEFIED NATURAL GAS
Environmental impacts of energy transportation
[DE82-900316] N82-13559

LIQUID CHROMATOGRAPHY
Determination of radionuclide species by on-line radiochromatography using high resolution gamma ray spectroscopy N82-13181

LIQUID CRYSTALS
Physical adsorption of quantum atomic and molecular systems N82-13846
Nonlinear optical effects in liquid crystals
N82-13937
Fluorescent guest-host effect in scattering liquid crystals and new physical phenomena in thin liquid crystal films N82-13940
Multifunctions - liquid crystal displays
[BMFT-FB-T-80-181] N82-13957

LIQUID HELIUM
Welding of austenitic stainless steels for liquid-helium service
[DE81-025602] N82-13429

LIQUID METAL FAST BREEDER REACTORS
Substructure of 316 stainless steel pipe weldments --- liquid metal fast breeder reactor materials
N82-13215

LIQUID PHASE EPITAXY
Advanced indium antimonide monolithic charge coupled infrared imaging arrays
[NASA-CR-165799] N82-13356
An investigation of some magnetic properties of calcium substituted yttrium iron garnet films
N82-13935

LIQUID-SOLID INTERFACES
Surface enhanced Raman spectroscopy for interfacial characterization N82-13175
A quantitative study of factors influencing lamellar eutectic morphology during solidification
[NASA-TM-82451] N82-13218

LITHIUM
Defect structure and properties of intermetallic compound beta-LiAl N82-13959

LITHIUM FLUORIDES
Push-pull fatigue of LiF and MgO single crystals
N82-13960

LITHIUM NIOBATES
Investigation of photoacoustorefractive effect in LiNbO sub 3 SAW devices
[AD-A103705] N82-13880

LITHOSPHERE
Papers presented to the Conference on the Processes of Planetary Rifting
[LPI-CONTRIB-457] N82-13595

LOAD DISTRIBUTION (FORCES)
Calculation of wing-body-nacelle interference in subsonic and transonic potential flow N82-13095
Prediction of subsonic aircraft flows with jet exhaust interactions N82-13096

LOAD TESTS
Planning and analysis of a fatigue test programme
N82-13276
Variable amplitude fatigue testing N82-13278

LOADS (FORCES)
An experimental study of a reinforced concrete folded plate structure with edge beams N82-13443
Load and resistance factor design of cold-formed steel structural members N82-13464

LOCOMOTION
A digital TV system for the detection of high speed human motion N82-13289

LOCOMOTIVES
The influence of pressure waves on measurements of high speed train noise --- high pass filtering of pressure waves
[DFVLR-FB-81-06] N82-13837

LOGARITHMS
Probabilistic error analysis of floating point and CRD arithmetics N82-13758

LOGIC CIRCUITS
Concurrent testing and checking in computer systems N82-13751

LOGIC DESIGN
Interruption as a test of the user-computer interface N82-13721
Concurrent testing and checking in computer systems N82-13751
Automated partitioning of hierarchically specified digital systems N82-13752
Methods of verification of digital logic N82-13783
An algebraic model of fault masking logic
N82-13804

LOGICAL ELEMENTS
Methods of verification of digital logic N82-13783

LOGISTICS
The message processing and distribution system development
[AD-A104585] N82-13333

LONG TERM EFFECTS
Long-term operation of a sealed waveguide CO sub 2 laser
[AD-A105261] N82-13420
Geophysical monitoring for climatic change, number 8: Summary Report, 1979
[PB81-233355] N82-13631

LONGITUDINAL CONTROL
An analytical approach for predicting pilot induced oscillations N82-13688
A model for the submarine depthkeeping team
N82-13689

LONGITUDINAL STABILITY
Analysis of a longitudinal pilot-induced oscillation experienced on the approach and landing test of the space shuttle
[NASA-TM-81366] N82-13149

LONGITUDINAL WAVES
Nonlinear waves in rods
[AD-A101333] N82-13447

LOOP ANTENNAS
Excitation of radial resonator with annular slot
N82-13328

LOW ALTITUDE
Measurements of heavy ions in the low altitude regions of the outer zone
[AD-A099453] N82-13600

LOW FREQUENCIES
Superconducting magnetometry for cardiovascular studies and an application of adaptive filtering
N82-13648

LOW SPEED
Effects of intake geometry on circular pitot intake performance at zero and low forward speeds
N82-13070

LOW TEMPERATURE PHYSICS
Observation of high field DHVA effect and induced magnetism in single crystal TiBe sub 2
[DE81-025292] N82-13950

LOW THRUST PROPULSION
Low-thrust chemical propulsion system pump technology
[NASA-CR-165219] N82-13427

LOW VOLTAGE
Review of low-voltage CP detonators
[DE81-025837] N82-13250

LUBRICATING OILS
Examination of early wear detection in diesel engines by energy dispersive radioisotope X ray fluorescence analysis
[BMVG-FBWT-79-19] N82-13432
LUMINOUS INTENSITY
Submillimeter observations of solar limb-brightening in the total solar eclipse of 31 July 1981 N82-14043
LUNAR ROCKS
Catalog of lunar mare basalts greater than 40 grams. Part 1: Major and trace chemistry, with megascopic descriptions and rock and thin section photographs
[NASA-TM-84065] N82-14040

M

MACH NUMBER
Studies of air inlets at Reynolds numbers comparable to flight in ONERA's F1 and S1MA wind tunnels N82-13091
Airframe-propulsion system aerodynamic interference predictions at high transonic Mach numbers including off-design engine airflow effects N82-13098
MACHINE TOOLS
Mini-seminars on machining technology
[PB81-223034] N82-13273
MACHINING
Mini-seminars on machining technology
[PB81-223034] N82-13273
MAGNESIUM CHLORIDES
An improved stress corrosion test medium for aluminum alloys
[NASA-TM-82452] N82-13216
MAGNESIUM OXIDES
Push-pull fatigue of LiF and MgO single crystals N82-13960
MAGNETIC COILS
Feedback plasma control in hybrid poloidal coil system
[IPPJ-542] N82-13905
MAGNETIC DISTURBANCES
Magnetic results from Nurmijaervi Geophysical Observatory 1980, No. 22
[ISBN-951-697-155-5] N82-13590
MAGNETIC FIELD CONFIGURATIONS
Large-scale variations of the interplanetary magnetic field: Voyager 1 and 2 observations between 1-5 AU
[NASA-TM-83850] N82-13594
Rudimentary theories of the stability of microwave-heated plasmas N82-13910
MAGNETIC FIELDS
Compton scattering in a uniform, constant magnetic field N82-13968
MAGNETIC FLUX
Large-scale variations of the interplanetary magnetic field: Voyager 1 and 2 observations between 1-5 AU
[NASA-TM-83850] N82-13594
MAGNETIC LENSES
Optics of mass separator 1
[DE81-028242] N82-13886
MAGNETIC MATERIALS
Benefication with magnetic fluids
[PB81-227126] N82-13485
MAGNETIC MEASUREMENT
Magnetic results from Nurmijaervi Geophysical Observatory 1980, No. 22
[ISBN-951-697-155-5] N82-13590
Superconducting magnetometry for cardiovascular studies and an application of adaptive filtering N82-13648
MAGNETIC PROPERTIES
An investigation of some magnetic properties of calcium substituted yttrium iron garnet films N82-13935
Observation of high field DHVA effect and induced magnetism in single crystal TiBe sub 2
[DE81-025292] N82-13950
MAGNETIC SIGNATURES
Magnetically undetectable electronic circuit assemblies
[AD-A100669] N82-13358
MAGNETIC STORMS
. Solar-geophysical data. Comprehensive reports, part 2
[PB81-221186] N82-14045
MAGNETIC VARIATIONS
Large-scale variations of the interplanetary magnetic field: Voyager 1 and 2 observations between 1-5 AU
[NASA-TM-83850] N82-13594
MAGNETICALLY TRAPPED PARTICLES
Two-satellite study of proton drift on quiet days
[AD-A104736] N82-13601
MAGNETOCARDIOGRAPHY
Superconducting magnetometry for cardiovascular studies and an application of adaptive filtering N82-13648
MAGNETOELASTIC WAVES
A triggering of solar flare by magnetosonic waves in a neutral sheet plasma
[IPPJ-540] N82-14042
MAGNETOHYDRODYNAMIC FLOW
Magnetic clouds between 2-4 AU: Voyager observations
[NASA-TM-83849] N82-13593
MAGNETOHYDRODYNAMIC GENERATORS
Two-dimensional effects in power take-off region
[DE82-000091] N82-13367
Electrical effects of slag in a diffuse mode magnetohydrodynamic generator N82-13550
Testing and evaluation of MHD materials and substructures
[DE81-024331] N82-13926
MAGNETOHYDRODYNAMIC STABILITY
Stability considerations for light-ion beam transport in Z discharge channels
[AD-A101426] N82-13852
Plasma focus breeder
[IPPJ-541] N82-13904
EBT Stability Theory: Proceedings of the workshop
[DE81-030635] N82-13909
Rudimentary theories of the stability of microwave-heated plasmas N82-13910
Review of recent EBT coupled ring-core stability theory N82-13911
Brief survey of experimental investigation of instabilities in microwave-heated plasmas N82-13912
Fluctuation measurements in EBT N82-13913
Hot-electron ring stability at the University of Tennessee N82-13914
Eigenmode stability analysis for a bumpy torus N82-13915
Stability of hot electron plasma in the ELMO bumpy torus N82-13917
Analytical theory of interchange and compressional Alfven instabilities in EBT N82-13918
Microstability of the EBT boundary N82-13919
Kinetic stability analyses in a bumpy cylinder N82-13921
Driving force of the ballooning instability
[DE81-023099] N82-13923
Enhanced-confinement class of stellarators
[DE81-028727] N82-13924
MAGNETOHYDRODYNAMICS
Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-field
[NASA-TM-82750] N82-13908
MAGNETOPAUSE
The internal structure of the magnetopause
[AERONOMICA-ACTA-A-221-1980] N82-13589
MAGNETORESISTIVITY
An investigation of some magnetic properties of calcium substituted yttrium iron garnet films N82-13935
MAGNETOSPHERE
Measurements of heavy ions in the low altitude regions of the outer zone
[AD-A099453] N82-13600
MAGNETRONS
A relativistic magnetron with a thermionic cathode N82-13353
MAGNITUDE
Observations of faint comets at McDonald Observatory: 1978-1980 N82-14010
MAINTAINABILITY
Helicopter reliability and maintainability trends during development and production
[AD-A105775] N82-13136
MAINTENANCE
Practical aspects of instrumentation system installation, volume 13
[NASA-TM-84067] N82-13140
Dynamic mass spectrometry: A residual gas analysis method and some applications
[DE81-026230] N82-13195
Future directions in Navy electronic system reliability and survivability
[AD-A102460] N82-13438
MAN MACHINE SYSTEMS
Using voice control onboard combat aircraft N82-13056
Command-response data transmision to mechanical systems management effect on the crew/system interface N82-13057
The intelligent use of intelligent systems: Problems in engineering man/machine symbiosis N82-13058
Proceedings of the Seventeenth Annual Conference on Manual Control
[NASA-CR-165005] N82-13665
Supervisory control of remote manipulation: A preliminary evaluation N82-13675
Research issues in implementing remote presence in teleoperator control N82-13676
The persistence of a visual dominance effect in a telemanipulator task: A comparison between visual and electrotactile feedback N82-13677
Man/machine interface development for the REMOTEX concept N82-13678
Identification of cognitive factors related to remote work performance using closed circuit TV displays N82-13679
The influence of motion cues on driver-vehicle performance in a simulator N82-13681
Multiple man-machine interfaces N82-13682
Decision aids for airborne intercept operations in advanced aircrafts N82-13683
Using rewards and penalties to obtain desired subject performance N82-13684
A quasi-Newton procedure for identifying pilot-related parameters of the optimal control model N82-13694
Information and display requirements for aircraft terrain following N82-13695
A data collection scheme for identification of parameters in a driver model N82-13696
Multi-axis manual controllers: A state-of-the-art report N82-13701
Theoretical linear approach to the combined man-manipulator system in manual control of an aircraft N82-13702
The influence of ship motion of manual control skills N82-13703
The role of manipulator characteristics in selecting the ideal effective vehicle N82-13704
Experimental results with a six-degree-of-freedom force-reflecting hand controller N82-13707
Manual control analysis of drug effects on driving performance N82-13709
Human supervision and microprocessor control of an optical tracking system N82-13715
A theory of human error N82-13716
Stability analysis of automobile driver steering control N82-13717
Detecting human operator impairment with a psychomotor task N82-13718
A comparison of head and manual control for a position-control pursuit tracking task N82-13720
Interruption as a test of the user-computer interface N82-13721
A model for the control mode man-computer interface dialogue N82-13722
Taxonomy of the human factors in man machine systems N82-13726
MANAGEMENT METHODS
A summary of the Naval Postgraduate School Research Program
[AD-A104112] N82-13975
MANAGEMENT PLANNING
Five-year Hawaii water research agenda, 1982-1987
[PB81-231912] N82-13478
Managing information technology change in the decade of the 80's
[AD-A099441] N82-13976
MANAGEMENT SYSTEMS
SEPAC software configuration control plan and procedures, revision 1
[NASA-CR-161915] N82-13765
MANEUVERABILITY
Use of a helmet-mounted matrix display for presenting energy-maneuverability information during simulated close combat N82-13061

Maneuver load control for the reduction of design loads and improvement of the maneuverability of modern fighter aircraft
[BMVG-FBWT-81-2] N82-13138

MANGANESE
Spectroelectrochemical investigations in molten salt and aqueous media N82-13183

MANGANESE OXIDES
Quantitative investigations of mixed oxidation states of some first row transition metals in insulator matrices by photoelectron spectroscopy N82-13184

MANGANIN (TRADEMARK)
Pressure measurements of non-planar stress waves --- dual element strain gage
[DE81-028729] N82-13454

MANIFOLDS (MATHEMATICS)
The missing boundary problem for smooth manifolds of dimension greater than or equal to six N82-13806

MANIPULATORS
Dynamic analysis of flexible spatial mechanisms and robotic manipulators N82-13460
Multi-axis manual controllers: A state-of-the-art report N82-13701
Theoretical linear approach to the combined man-manipulator system in manual control of an aircraft N82-13702
The role of manipulator characteristics in selecting the ideal effective vehicle N82-13704
Design and development of a six degree of freedom hand controller N82-13706
Experimental results with a six-degree-of-freedom force-reflecting hand controller N82-13707

MANUAL CONTROL
Proceedings of the Seventeenth Annual Conference on Manual Control
[NASA-CR-165005] N82-13665
Pupillometric measurement of operator workload N82-13666
The cognitive demands of second order manual control: Applications of the event related brain potential N82-13667
A study on task difficulty and acceleration stress N82-13668
Subjective rating scales as a workload N82-13669
Physiological assessment of operator workload during manual tracking. 1: Pupillary responses N82-13670
Horizontal conflict resolution maneuvers with a cockpit display of traffic information N82-13671
Some effects of Field Of View (FOV) and target size on lateral tracking at hover N82-13672
Video framerate, resolution and grayscale tradeoffs for undersea telemanipulator N82-13673
Predictor symbology in computer-generated perspective displays N82-13674
Multi-axis manual controllers: A state-of-the-art report N82-13701
Theoretical linear approach to the combined man-manipulator system in manual control of an aircraft N82-13702
The influence of ship motion of manual control skills N82-13703
The role of manipulator characteristics in selecting the ideal effective vehicle N82-13704
Computer aided manual tracking N82-13705
Design and development of a six degree of freedom hand controller N82-13706
Manual control analysis of drug effects on driving performance N82-13709
A theory of human error N82-13716
Stability analysis of automobile driver steering control N82-13717
A comparison of head and manual control for a position-control pursuit tracking task N82-13720

MANUFACTURING
Design procedures for a commercial scale thermal evaporation system to deposit CdS for solar cell manufacture N82-13551
Increase in the profitability of design and process planning by integrated and graphic data processing, phase 1
[BMFT-FB-W-81-005] N82-13777

MANY BODY PROBLEM
Relativistic many-body perturbation theory of parity-violation in atoms N82-13845

MAPPING
The existence of nonzero maps from injectives to projectives N82-13808

MARINE BIOLOGY
Ecology and distribution of the Benthic community on the Monterey Breakwater, Monterey, California
[AD-A102047] N82-13555

MARINE ENVIRONMENTS
Flow distribution control characteristics in marine gas turbine waste-heat recovery systems. Phase 1: Flow distribution characteristics and control in diffusers
[AD-A104560] N82-13390
Environmental and radiological safety studies: Interaction of (238) PuO2 heat sources with terrestrial and aquatic environments
[DE81-032019] N82-13565
Environmental assessment of the Alaskan Continental Shelf: Annual reports of principal investigators for the year ending March 1980. Volume 5: Hazards
[PB81-225732] N82-13607
A review of one-dimensional oceanic mixed-layer models
[AD-A103279] N82-13640
Artificial Reefs: Proceedings of a Conference
[PB81-227779] N82-13644

MARKING
Structure of the knowledge base for an expert labeling system N82-13723

MARKOV PROCESSES
A systems analysis of the maturation of sleep using a semi-Markov model N82-13658

MARSHLANDS
Evaluation of reef shell embankment
[PB81-232761] N82-13266

MARTENSITIC STAINLESS STEELS
Fatigue crack propagation studies in two cryogenic steels N82-13213
Effect of low-temperature irradiation with (n, alpha) helium production on tensile properties of 12 Cr-1 Mo VW-type steels
[DE81-028578] N82-13222

MASS FLOW
Experimental and analytical investigation of a fluidic power generator
[JPL-PUB-81-100] N82-13386

MASS RATIOS
Pattern of neutrino mixing in grand unified theories
[DE81-029034] N82-13872

MASS SPECTRA
Spectral functions in quantum chromodynamics and applications N82-13969

MASS SPECTROMETERS
Dynamic mass spectrometry: A residual gas analysis method and some applications
[DE81-026230] N82-13195

MASS TRANSFER
Simultaneous heat and mass transfer in a porous medium N82-13404
Turbulent transfers in the atmospheric surface layer under varied stability conditions. A laboratory study N82-13586

MASSACHUSETTS
Massachusetts' five-year water resources research needs, 1982-1987
[PB81-231961] N82-13480
Intermediate photovoltaic system application experiment operational performance report. Volume 2 for Beverly High School, Beverly, Mass.
[DE82-000811] N82-13532

MATERIAL ABSORPTION
Studies of photoionization in liquids using a laser two-photon ionization conductivity technique
[DE81-026514] N82-13194
Aircraft measurements and mathematical modeling of the removal of gaseous air pollutants at natural air-land and air-water interfaces N82-13577

MATERIALS HANDLING
Testing of a work bench for handling of explosives in the laboratory
[FOA-C-20393-D1] N82-13397
Creating a safer environment in US coal mines: The Bureau of Mines Methane Control Program, 1964-79
[PB81-233918] N82-13488

MATERIALS RECOVERY
Power-plant fly-ash utilization: A chemical-processing perspective
[DE81-025452] N82-13191

MATHEMATICAL LOGIC
Proving total correctness of nondeterministic programs in infinitary logic
[MC-IW-150/80] N82-13799
Parallel scheduling algorithms
[AD-A103796] N82-13820

MATHEMATICAL MODELS
Subsonic military aircraft engine intake: An integrated theoretical experiment design N82-13073
A real time Pegasus propulsion system model for VSTOL piloted simulation evaluation
[NASA-TM-82770] N82-13144
On the modeling and control of flexible space structures N82-13168
Theoretical equations of state for metals
[DE81-028743] N82-13224
Optical polishing of metals
[DE81-028690] N82-13225
Mathematical model of differential reflectometry for use in the investigation of thin film corrosion products N82-13232
Analysis and behavior of structures on discrete tensionless foundations N82-13286
Two-path model of fading in a high data rate communication channel N82-13292
Antenna (selected articles)
[AD-B060598] N82-13307
Use of principle of regularization in direct and mixed problems of the theory of the synthesis of radiating systems N82-13309
Synthesis of a plane system of discrete emitters N82-13310
Surface-patch techniques for modeling three-dimensional radiating or scattering objects
[AD-A100212] N82-13336
Two-dimensional effects in power take-off region
[DE82-000091] N82-13367
Validation, modeling, and computer assisted design program for power converters --- confirmation of dc/dc converters predicted performance
[ESTEC/DERA-8/7208] N82-13370
Experimental and analytical investigation of a fluidic power generator
[JPL-PUB-81-100] N82-13386
Modeling of turbulent mixing at density discontinuities in nonsteady compressible flows
[AD-A105564] N82-13391
Formulas for one-dimensional local properties for molecular-dynamics simulations of shock waves
[DE82-000906] N82-13395
Numerical experiments on two-phase liquid-vapor mist transport N82-13402
Study of corrugated plates N82-13426
Analysis of multicylinder IC-Engine crankshafts with hydrodynamic bearings using a finite element-transfer matrix approach N82-13437
A continuum model for friction with applications in metal forming plasticity N82-13445
Camelot: A novel concept for a multiterawatt pulse power generator for single pulse burst or repetition rate operation
[AD-A103024] N82-13513
The internal structure of the magnetopause
[AERONOMICA-ACTA-A-221-1980] N82-13589
On the inadequacy of one dimensional ocean models for the global carbon cycle
[CM-51] N82-13643
Proceedings of the Seventeenth Annual Conference on Manual Control
[NASA-CR-165C05] N82-13665
On the internal target model in a tracking task N82-13700
Language, computation, and reality N82-13757
Compiler generation from lambda calculus definitions of programming languages N82-13759
An upper asymptote for the three-parameter logistic item-response model
[AD-A103013] N82-13816
Inclusive charged particle spectrum from the interaction of nuclei with intermediate energy proton N82-13848
Analysis of coupled translational and rotational diffusion using operator calculus N82-13849
On high beta equilibria of plasmas in the quasi-uniform current model: Influence of shaping the plasma cross section and of the second order in the inverse aspect ratio
[REPT-81-131] N82-13927
Fundamental studies of grain-boundary passivation in polycrystalline silicon with application to improved photovoltaic devices
[DE82-000825] N82-13956

The physical and electrical properties of polycrystalline-silicon N82-13964
A new approach to modeling the cost of ownership for aircraft systems
[AD-A104434] N82-13979
A triggering of solar flare by magnetosonic waves in a neutral sheet plasma
[IPPJ-540] N82-14042

MATHEMATICAL PROGRAMMING
Synthesis of nonequidistant line-source antenna by the statistical methods of search N82-13329
New optimization research
[AD-A104864] N82-13793

MATRICES (MATHEMATICS)
MERLIN: A computer program to transfer finite-element meshes
[DE82-000806] N82-13775
A stochastic extension of the structural properties of compartment models via a Kronecker algebra N82-13810
Mechanistic studies of electron exchange kinetics using ab initio
[DE81-026096] N82-13856
Pattern of neutrino mixing in grand unified theories
[DE81-029034] N82-13872

MAXIMUM LIKELIHOOD ESTIMATES
A contribution to robust detection and estimation N82-13809
Transforming contingency tables
[AD-A104182] N82-13821

MEAN
A Bayesian approach to the symmetric multiple comparisons problem in the two-way balanced design N82-13819

MEAN FREE PATH
Energy losses and mean free paths of electrons in silicon dioxide
[DE81-026353] N82-13860

MECHANICAL DRIVES
Low-thrust chemical propulsion system pump technology
[NASA-CR-165219] N82-13427
The ac propulsion system for an electric vehicle, phase 1
[NASA-CR-165480] N82-13506
Controlled Speed Accessory Drive demonstration program
[NASA-CR-165010] N82-13981

MECHANICAL ENGINEERING
Compilation of abstracts of dissertations theses, and research papers submitted by candidates for degrees, 1 October 1979 - 30 September 1980
[AD-A104124] N82-13974

MECHANICAL PROPERTIES
Strengthening phases and deformation mechanisms in dispersion strengthened solid solutions and pure metals N82-13229
Structure-property relationships in segmented elastomers: Small angle X-ray scattering, thermal, and mechanical studies N82-13240
Micromechanics of expansive mechanisms in expansive cement concretes N82-13258
A laboratory evaluation of modified asphalt
[PB81-231615] N82-13269
Thin-walled structures. Trapezoidal sheet bending and under shear stresses
[VTT-11] N82-13456
The physical and electrical properties of polycrystalline-silicon N82-13964

MEDICAL SCIENCE
Health and safety research division
[DE81-026088] N82-13652
The relationship between the number of factors and size of an experiment --- a medical diagnostics case
[AD-A103877] N82-13792

MELTING
New ways of looking for phase transitions at multi-megabar dynamic pressures
[DE81-028771] N82-13223

MENTAL PERFORMANCE
The cognitive demands of second order manual control: Applications of the event related brain potential N82-13667

MERCURY COMPOUNDS
HgCdTe fabrication using directed energy techniques
[AD-A105626] N82-13947

MESH
Mesh generating and plotting facilities of the LAMCAL program
[EUR-7099-EN] N82-13778

MESSAGE PROCESSING
The message processing and distribution system development
[AD-A104585] N82-13333
A specification and proof technique for message-based systems and its application to distributed database algorithms N82-13756

METABOLISM
Metabolism summaries of selected halogenated organic compounds in human and environmental media, a literature survey: First update
[PB81-232811] N82-13655

METAL COATINGS
Wear properties of electrodeposited titanium diboride coatings
[PB81-233314] N82-13199

METAL COMPOUNDS
Determination of radionuclide species by on-line radiochromatography using high resolution gamma ray spectroscopy N82-13181

METAL CRYSTALS
Low energy X-ray spectrometer
[DE81-025824] N82-13407
The structure and properties of grain boundaries N82-13962

METAL CUTTING
Mini-seminars on machining technology
[PB81-223034] N82-13273

METAL FATIGUE
Cyclic deformation and fatigue crack initiation of a coherently precipitating Ni-14.4 at % Al alloy N82-13212
Cyclic deformation and fatigue microcrack initiation in pearlitic eutectoid steel N82-13230
Fatigue Test Methodology
[AGARD-LS-118] N82-13274
The role of fatigue testing N82-13275
Elevated temperature fatigue testing of metals N82-13281
Fatigue tests with a corrosive environment N82-13282
Methods of obtaining crack growth data in metals N82-13283
Cyclic strain approach to fatigue in metals N82-13285

METAL FILMS
The chemical vapor deposition of iridium
[AD-A104582] N82-13360
An investigation of some magnetic properties of calcium substituted yttrium iron garnet films N82-13935

METAL FOILS
Impedance-match experiments using high intensity lasers
[DE81-025802] N82-13422

METAL HALIDES
Preparation, characterization and performance of non-uniform metal catalysts N82-13204

METAL HYDRIDES
Development and optimization of hydrogen storage materials using surface analytical techniques
[BMVG-FBWT-80-6] N82-13546

METAL IONS
Metal ion modification of polymeric sulfur nitride, (SN) subx, electrodes and electrochemical reduction of acetylene at a molybdenum modified (SN)sub x electrode N82-13185
Composition dependence of neodymium optical homogeneous linewidths in glasses N82-13945

METAL JOINTS
Analysis of steel beam-to-column moment connections N82-13444

METAL MATRIX COMPOSITES
Explosive-metal composites and electrical switch technology
[AD-A099476] N82-13361

METAL OXIDE SEMICONDUCTORS
Charge-based modeling of capacitance in MOS transistors N82-13350
Study of the physics of insulating films as related to the reliability of metal-oxide semiconductor devices
[AD-A105030] N82-13359
A simplified two-dimensional numerical analysis of MOS devices including transient penomena N82-13372

METAL OXIDES
Deformation-enhanced photoemission from metals N82-13231
Mathematical model of differential reflectometry for use in the investigation of thin film corrosion products N82-13232

METAL PARTICLES
Examination of early wear detection in diesel engines by energy dispersive radioisotope X ray fluorescence analysis
[BMVG-FBWT-79-19] N82-13432

METAL PLATES
Behavior of plane panels in ship structures with local initial deflections
[BMVG-FBWT-80-18] N82-13455
Gamma ray buildup factors in lead-iron and iron-lead shields
[EUR-7086-EN] N82-13864

METAL POLISHING
Optical polishing of metals
[DE81-028690] N82-13225

METAL POWDER
Potential use of the minicomputer controlled powder diffractometer for the structure determination of small quantities of rather impure materials N82-13207

METAL SHEETS
Thin-walled structures. Trapezoidal sheet bending and under shear stresses
[VTT-11] N82-13456

METAL SURFACES
Surface enhanced Raman spectroscopy for interfacial characterization N82-13175
Investigation into the role of NaCl deposited on oxide and metal substrates in the initiation of hot corrosion
[NASA-CR-165029] N82-13217
Development and optimization of hydrogen storage materials using surface analytical techniques
[BMVG-FBWT-80-6] N82-13546

METAL WORKING
A continuum model for friction with applications in metal forming plasticity N82-13445

METAL-NITRIDE-OXIDE-SILICON
Charge trapping in interface doped MNOS structures N82-13930

METALLIC GLASSES
Composition dependence of neodymium optical homogeneous linewidths in glasses N82-13945

METALLIZING
Magnetically undetectable electronic circuit assemblies
[AD-A100669] N82-13358
Development of technique for AR coating and nickel and copper metallization of solar cells: FPS project, product development
[NASA-CR-165033] N82-13499
High resolution, low cost solar cell contact development
[NASA-CR-165032] N82-13501

METEOROIDS
New problems of cometary observations from space N82-13994

METEOROLOGICAL CHARTS
Annual data and verification tabulation, eastern North Pacific tropical storms and hurricanes 1980
[PB81-230336] N82-13636

METEOROLOGICAL PARAMETERS
The District of Columbia Five-Year Water Resources Research Program Plan, 1982-1987
[PB81-234882] N82-13482
Tables of statistical summaries for the SURE aircraft measurements
[DE82-900317] N82-13564
Geophysical monitoring for climatic change, number 8: Summary Report, 1979
[PB81-233355] N82-13631

METEOROLOGICAL RADAR
Joint agency Doppler technology tests
[AD-A100208] N82-13335

METEOROLOGICAL SERVICES
National Weather Service public forecast verification
[PB81-231714] N82-13632

METEOROLOGY
Project Skywater: Fiscal year 1979 report. Atmospheric Resources Research Program
[PB81-234494] N82-13629
A summary of the Naval Postgraduate School Research Program
[AD-A104112] N82-13975

METHANATION
Solar-central-receiver fuels and chemicals
[DE82-000941] N82-13530
METHANE
Control of methane by ventilation of shafts during raise drilling
[PB81-234502] N82-13487
Creating a safer environment in US coal mines: The Bureau of Mines Methane Control Program, 1964-79
[PB81-233918] N82-13488
Solar-central-receiver fuels and chemicals
[DE82-000941] N82-13530
Biomethanation of biomass pyrolysis gases
[DE82-000238] N82-13541
METHOD OF CHARACTERISTICS
An initial study of the application of the numerical method of characteristics to unsteady flow analysis in partially filled gravity drainage sized pipes
[PB81-229189] N82-13399
Determination of two-stroke engine exhaust noise by the method of characteristics
[NASA-TM-84061] N82-13827
METHOD OF MOMENTS
A hybrid method which combines a moment method current with an asymptotic current
[AD-A102199] N82-13340
METHYLENE BLUE
Spectroelectrochemistry, flash photolysis and photogalvanic effect of methylene blue and safranin-0 N82-13208
MICA
Low energy X-ray spectrometer
[DE81-025824] N82-13407
MICROANALYSIS
Micromechanics of expansive mechanisms in expansive cement concretes N82-13258
MICROCOMPUTERS
Potential use of the minicomputer controlled powder diffractometer for the structure determination of small quantities of rather impure materials N82-13207
Development report: Automatic System Test and Calibration (ASTAC) equipment
[NASA-CR-165403] N82-13505
MICROCRACKS
Micromechanics of expansive mechanisms in expansive cement concretes N82-13258
Investigation of the acoustic emission and deformation response of finite ice plates
[AD-A103731] N82-13471
MICROORGANISMS
Ecology and distribution of the Benthic community on the Monterey Breakwater, Monterey, California
[AD-A102047] N82-13555
MICROPHONES
Double beam-in-time photoacoustic spectroscopy N82-13180
MICROPROCESSORS
A central microprocessor controlled electrical storage heating system
[BMFT-FB-T-80-182] N82-13547
Human supervision and microprocessor control of an optical tracking system N82-13715
Beyond mere automation
[AD-A103838] N82-13736
MICROSTRIP TRANSMISSION LINES
Experimental and theoretical investigations with laboratory models of phased array antenna
[BMVG-FBWT-79-21] N82-13341
MICROSTRUCTURE
Acoustic nondestructive evaluation of microstructure --- pure copper and plain carbon and low alloy steels N82-13211
An investigation of notch low cycle fatigue life behavior of Rene' 80 at high temperature N82-13214
Substructure of 316 stainless steel pipe weldments --- liquid metal fast breeder reactor materials N82-13215
Structure-property relationships in segmented elastomers: Small angle X-ray scattering, thermal, and mechanical studies N82-13240
Micromechanics of expansive mechanisms in expansive cement concretes N82-13258
The structure and properties of grain boundaries N82-13962
MICROWAVE ATTENUATION
Microwave attenuation and brightness temperature due to the gaseous atmosphere: A comparison of JPL and CCIR values
[NASA-CR-165027] N82-13300
MICROWAVE HOLOGRAPHY
Discrimination of hologram and antenna theory N82-13320
MICROWAVE SCATTERING
High frequency scattering from multiple finite elliptic cylinders N82-13291
MICROWAVE SPECTRA
Conductivity and permittivity measurements of fast ion conductors in the microwave region N82-13351
MICROWAVE TRANSMISSION
Effects of the Satellite Power System on low Earth orbit and geosynchronous satellites
[PB81-232019] N82-13157
MICROWAVES
Microwave attenuation and brightness temperature due to the gaseous atmosphere: A comparison of JPL and CCIR values
[NASA-CR-165027] N82-13300
Conductivity and permittivity measurements of fast ion conductors in the microwave region N82-13351
MILITARY AIR FACILITIES
Geothermal-resource verification for Air Force Bases
[DE81-027482] N82-13520
MILITARY AIRCRAFT
Electronic flight deck displays for military transport aircraft N82-13050
MILITARY HELICOPTERS
Integration of controls and displays in US Army helicopter cockpits N82-13053
MILITARY TECHNOLOGY
Fiber optics (optical waveguides) technology: Potential application in the DCS
[AD-A104740] N82-13303
MILLIMETER WAVES
Antenna (selected articles)
[AD-A106499] N82-13323
A statistical analysis of irregular quasi-optical lines (beam guides) with the aid of computer(s) N82-13324
Directed dividers on the metal-dielectric waveguides N82-13326
Millimeter wave alternate route study
[AD-A102303] N82-13339
Millimeter wave radiometry as a means of determining cometary surface and subsurface temperature N82-14003
MINERAL DEPOSITS
A depositional model for major coal seams in the Rock Springs Formation, Upper Cretaceous, southwest Wyoming N82-13580
Petrology and geochemistry of ophiolite fragments in a tectonic melange, Kodiak Islands, Alaska N82-13610
An investigation of the nickel-cobalt occurrence in the southeast Missouri mining district N82-13613
MINERALOGY
An investigation of the nickel-cobalt occurrence in the southeast Missouri mining district N82-13613
MINERALS
Rates and mechanisms of chemical weathering in an organic environment at Panolo Mountain, Georgia N82-13615
MINES (EXCAVATIONS)
Review of fire test methods and incident data for portable electric cables in underground coal mines
[PB81-227878] N82-13272
Deep Ocean Mining Environmental Study. Environmental effects of commercial-scale mining
[PB81-227753] N82-13484
Control of methane by ventilation of shafts during raise drilling
[PB81-234502] N82-13487
Suppression of coal dust explosion by water barrier in a conveyor belt entry
[PB81-233306] N82-13489
MINIATURE ELECTRONIC EQUIPMENT
Development of a miniaturised digital thrust demand unit N82-13055
MINICOMPUTERS
A digital TV system for the detection of high speed human motion N82-13289
MINNESOTA
Development of peatlands in northern Minnesota
[DE82-000873] N82-13475
MIRROR FUSION
Electron-cyclotron resonant heated electron distribution functions N82-13920
MIRRORS
Double beam-in-time photoacoustic spectroscopy N82-13180
Low energy X-ray spectrometer
[DE81-025824] N82-13407
MISSILE CONFIGURATIONS
Consolidation of data base for Army generalized missile model
[NASA-CR-166273] N82-13046
MISSILE TESTS
Consolidation of data base for Army generalized missile model
[NASA-CR-166273] N82-13046
Pressure distributions on three different cruciform aft-tail control surfaces of a wingless missile at Mach 1.60, 2.36, and 3.70. Volume 1: Trapezoidal tail
[NASA-TM-80097] N82-13110
MISSILE TRACKING
Modeling human tracking error in several different anti-tank systems N82-13699
On the internal target model in a tracking task N82-13700
MISSION PLANNING
Anticipated results from dust experiments on cometary missions N82-13993
Plans for Comet Halley --- ESA's Giotto mission, Japan's Planet-A mission, and the U.S.S.R. Venera-Halley mission N82-14024
The ESA mission to Comet Halley N82-14025
MISSOURI
An investigation of the nickel-cobalt occurrence in the southeast Missouri mining district N82-13613
MIST
Numerical experiments on two-phase liquid-vapor mist transport N82-13402
MODAL RESPONSE
Study of corrugated plates N82-13426
MODELS
AC harmonic filtering using controlled current injection N82-13348
MODULATION
Modulation/demodulation techniques for satellite communications. Part 1: Background
[NASA-CR-165020] N82-13301
Investigation of modulation methods and system aspects for regenerative satellite-repeater
[BMFT-FB-W-80-024] N82-13342
MODULUS OF ELASTICITY
Optical polishing of metals
[DE81-028690] N82-13225
MOISTURE
Effects of hygrothermal conditioning on the dynamic behavior of resin matrix composites N82-13172
MOISTURE CONTENT
An apparatus and procedure for calibrating a water vapor analyzer in the 0.1- to 15-ppm range
[PB81-231185] N82-13413
MOLECULAR BEAMS
A study of the formation and structure of small clusters of noble gases and sulfur hexafluoride formed in Laval Nozzle molecular beams N82-13201
MOLECULAR CLOUDS
Radiation-hydrodynamics of HII regions and molecular clouds
[DE81-028696] N82-14032
MOLECULAR DIFFUSION
Analysis of coupled translational and rotational diffusion using operator calculus N82-13849
MOLECULAR EXCITATION
Experimental and theoretical studies of excited state transport N82-13967
MOLECULAR INTERACTIONS
Molecular interactions in amphiphilic association structures N82-13206
Electrostatic and hydrodynamic interactions of charged macromolecular systems N82-13242
Formulas for one-dimensional local properties for molecular-dynamics simulations of shock waves
[DE82-000906] N82-13395
Role of molecular dynamics on descriptions of shock front processes
[DE81-028687] N82-13857
Infrared vibrational predissociation spectroscopy of small molecular clusters
[DE81-028648] N82-13687
MOLECULAR SPECTRA
Ground-based cometary spectroscopy N82-14007

MOLECULAR SPECTROSCOPY
Studies of sample introduction for inductively coupled plasma emission spectrometry N82-13209
Radio observations of comets N82-14002
The spectroscopy of comets: Introductory remarks N82-14004
MOLECULAR STRUCTURE
Resonance Raman spectroscopic investigations of the active site structures of hemoglobin and hemerythrin N82-13176
Strengthening phases and deformation mechanisms in dispersion strengthened solid solutions and pure metals N82-13229
Defect studies of molecular and rare-gas crystals down to 50mK and up to 150 MPa
[DE81-026617] N82-13949
MOLECULES
Molecular dynamics calculations for sodium using pseudopotential theory
[DE81-029022] N82-13853
MOLLUSKS
Evaluation of reef shell embankment
[PB81-232761] N82-13266
MOLTEN SALT ELECTROLYTES
Spectroelectrochemical investigations in molten salt and aqueous media N82-13183
MOMENT DISTRIBUTION
Inelastic overload analysis of continuous steel multi-girder highway bridges by the finite-element method N82-13440
Analysis of steel beam-to-column moment connections N82-13444
MOMENTUM TRANSFER
Turbulent transfers in the atmospheric surface layer under varied stability conditions. A laboratory study N82-13586
MONITORS
Two-channel telemeter for use in a 3-inch spin air gun
[AD-A102566] N82-13165
Examination of early wear detection in diesel engines by energy dispersive radioisotope X ray fluorescence analysis
[BMVG-FBWT-79-19] N82-13432
Computer-automated controls for superconducting magnetic energy storage
[DE81-028697] N82-13521
A monitor for noninvasive estimation of pulmonary blood flow N82-13656
MONOCHROMATORS
Construction and maintenance of SUNY facilities at the National Synchrotron Light Source
[DE81-027855] N82-13152
MONOCULAR VISION
Monocular vision and tactical flight on the helicopter N82-13059
MONOMERS
Polymers with mesomorphic organization in the side chains from vinyl monomers with mesogenic or potentially mesogenic elements N82-13234
MONTANA
Environmental effects of pollutants from coal combustion. 2: The Colstrip, Montana Power Plant
[PB81-234114] N82-13573
MONTE CARLO METHOD
Modeling human tracking error in several different anti-tank systems N82-13699
On the internal target model in a tracking task N82-13700
A stochastic extension of the structural properties of compartment models via a Kronecker algebra N82-13810
MONTEREY BAY (CA)
Ecology and distribution of the Benthic community on the Monterey Breakwater, Monterey, California
[AD-A102047] N82-13555
MORPHOLOGY
A quantitative study of factors influencing lamellar eutectic morphology during solidification
[NASA-TM-82451] N82-13218
Structure-property relationships in segmented elastomers: Small angle X-ray scattering, thermal, and mechanical studies N82-13240
MOTION SIMULATORS
The influence of motion cues on driver-vehicle performance in a simulator N82-13681
The influence of ship motion of manual control skills N82-13703
MOTIVATION
Using rewards and penalties to obtain desired subject performance N82-13684
MRCA AIRCRAFT
The design and development of the Tornado engine air intake N82-13074
The subsonic performance of practical military variable area convergent nozzles N82-13076
MULTIPATH TRANSMISSION
Large volume multiple-path nuclear pumped laser
[NASA-CASE-LAR-12592-1] N82-13415
MULTIPHOTON ABSORPTION
Analytical detection of organic species by means of laser-induced multiphoton ionization N82-13646
MULTIPLEXING
Techniques for interfacing multiplex systems
[AD-A101457] N82-13135
Millimeter wave alternate route study
[AD-A102303] N82-13339
MULTIPLIERS
Design and fabricate a CCD analog multiplier
[AD-A105557] N82-13364
MULTIPROCESSING (COMPUTERS)
An analytical study of multiprocessor system reliability N82-13728
Preemptive scheduling of a multiprocessor system with memories to minimize L sub max
[AD-A103795] N82-13734
Beyond mere automation
[AD-A103838] N82-13736
Distributed and decentralized control in fully distributed processing systems
[AD-A104379] N82-13739
Direct execution string processor N82-13753
MUONS
Inelastic scattering of high energy muons from nuclear targets N82-13874
MUSCULAR FUNCTION
Benefits of detailed models of muscle activation and mechanics N82-13713
MYOCARDIUM
Algorithms for imaging myocardial blood flow using X-ray computed tomography N82-13661

N

NACELLES
Aerodynamics of Power Plant Installation
[AGARD-CP-301] N82-13065
Model testing techniques for measuring inlet drag N82-13084
The role and implementation of different nacelle/engine simulation concepts for wind-tunnel testing in research and development work on transport aircraft N82-13086
Wind tunnel tests of powered models: A comparison of two methods of simulating the jets of jet engines N82-13087
Wind tunnel test and analysis techniques using powered simulators for civil nacelle installation drag assessment N82-13088
Establishment of an experimental technique to provide accurate measurement of the installed drag of close coupled civil nacelle/airframe configurations, using a full span model with turbine powered engine simulators N82-13089
Evaluation of an experimental technique to investigate the effects of the engine position on engine/pylon/wing interference N82-13090
The influence of closed-coupled, rear fuselage mounted nacelles on the design of an advanced high speed wing N82-13092
Aerodynamic aspects of a high bypass ratio engine installation on a fuselage afterbody N82-13093
A numerical method for studying nacelle-jet-airfoil interaction in inviscid three-dimensional flow N82-13094
Airframe-propulsion system aerodynamic interference predictions at high transonic Mach numbers including off-design engine airflow effects N82-13098
Thrust modulation methods for a subsonic V/STOL aircraft
[NASA-TM-82747] N82-13112
NASA PROGRAMS
Reports of Planetary Geology Program, 1981
[NASA-TM-84211] N82-14041
Report on research and technology-FY 1981
[NASA-TM-81367] N82-14047
NATURAL GAS
Natural gas plan needed to provide greater protection for high-priority and critical uses
[PB81-228488] N82-13255
NATURAL LANGUAGE (COMPUTERS)
Preliminary analysis of a breadth-first parsing algorithm: Theoretical and experimental results
[AD-A101852] N82-13797
NAVIER-STOKES EQUATION
Prediction of subsonic aircraft flows with jet exhaust interactions N82-13096
Navier-Stokes solutions for a supersonic coflowing axisymmetric nozzle with a thick annulus N82-13101
Numerical analysis of the scramjet-inlet flow field by using two-dimensional Navier-Stokes equations
[NASA-TP-1940] N82-13142
A solution of the Navier-Stokes equations by a mixed finite element method
[ONERA-NT-1981-1] N82-13398
NAVIGATION AIDS
Horizontal conflict resolution maneuvers with a cockpit display of traffic information N82-13671
NAVY
Future directions in Navy electronic system reliability and survivability
[AD-A102460] N82-13438
A summary of the Naval Postgraduate School Research Program
[AD-A104112] N82-13975
NEAR INFRARED RADIATION
Laboratory measurements of physical, chemical, and optical characteristics of Lake Chicot sediment waters
[NASA-TP-1941] N82-13468
NEAR WAKES
Some observations of surface pressures and the near wake of a blunt trailing edge airfoil N82-13100
NEGATIVE IONS
Trapped ion research
[AD-A098648] N82-13188
NEODYMIUM
Composition dependence of neodymium optical homogeneous linewidths in glasses N82-13945
NERVOUS SYSTEM
Functional structure and dynamics of the human nervous system N82-13692
NETWORK ANALYSIS
Flow control and routing in an integrated voice and data communication network
[AD-A103342] N82-13337
NETWORK SYNTHESIS
Computer implementation of optimal multivariable controller design in the frequency domain N82-13785
NEUROMUSCULAR TRANSMISSION
Computational problems in autoregressive moving average (ARMA) models N82-13698
Model simulation studies to clarify the effect on saccadic eye movements of initial condition velocities set by the Vestibular Ocular Reflex (VOR) N82-13712
Benefits of detailed models of muscle activation and mechanics N82-13713
NEUROTRANSMITTERS
Neurotransmitter function in the basal ganglia after acute and chronic ethanol treatment
[AD-A103744] N82-13649
NEUTRINOS
Pattern of neutrino mixing in grand unified theories
[DE81-029034] N82-13872
NEUTRON CROSS SECTIONS
Double differential continuum neutron scattering cross sections in iron and nickel for incident energies of 7.5, 10 and 12 MeV N82-13847
NEUTRON IRRADIATION
Effect of low-temperature irradiation with (n, alpha) helium production on tensile properties of 12 Cr-1 Mo VW-type steels
[DE81-028578] N82-13222
Positron lifetime and Doppler broadening techniques applied to irradiation damaged silver
[DE81-028688] N82-13854
NEUTRON SOURCES
Gas target neutron generator studies
[UTIAS-251] N82-13850

NEW MEXICO
Environmental effects of pollutants from coal combustion. 1: The Four Corners Power Plant, Farmington, N.M.
[PB81-230427] N82-13572
NEW YORK
Preliminary investigation of a shallow ground-water flow system associated with Connetquot Brook, Long Island, New York
[PB81-228751] N82-13481
NEWTON-RAPHSON METHOD
A quasi-Newton procedure for identifying pilot-related parameters of the optimal control model N82-13694
NICKEL
Effect of low-temperature irradiation with (n, alpha) helium production on tensile properties of 12 Cr-1 Mo VW-type steels
[DE81-028578] N82-13222
The trace metal stratigraphy and recent sedimentary history of anthrogenous particulates on the San Pedro Shelf, California N82-13579
An investigation of the nickel-cobalt occurrence in the southeast Missouri mining district N82-13613
Double differential continuum neutron scattering cross sections in iron and nickel for incident energies of 7.5, 10 and 12 MeV N82-13847
NICKEL ALLOYS
Cyclic deformation and fatigue crack initiation of a coherently precipitating Ni-14.4 at % Al alloy N82-13212
Workshop proceedings: U-bend tube cracking in steam generators
[DE81-903765] N82-13515
NICKEL COATINGS
Development of technique for AR coating and nickel and copper metallization of solar cells: FPS project, product development
[NASA-CR-165033] N82-13499
NIGHT VISION
Experimental investigation of a helmet mounted sight/display for helicopter N82-13060
NIOBIUM
Spectroelectrochemical investigations in molten salt and aqueous media N82-13183
Ultrasonic attenuation and velocity studies in the alpha-alpha' solid solution phases of the Nb-H system
[DE81-026618] N82-13836
Upper critical fields and span states in A-15 superconductors, part 1. Vortices in two-dimensional superconductors, part 2 N82-13942
Electron beam evaporation of superconducting, A15 niobium-silicon N82-13944
NIOBIUM ALLOYS
Superconductivity of the A15 compound niobium aluminum N82-13932
NIOBIUM OXIDES
Local density studies of electronic structure and bonding in transition metal compounds N82-13936
NITRIC OXIDE
Reduction of nitric oxide in a fluidized bed
[DE81-030488] N82-13198
NITRIDES
Metal ion modification of polymeric sulfur nitride, (SN) subx, electrodes and electrochemical reduction of acetylene at a molybdenum modified (SN)sub x electrode N82-13185
NITROGEN OXIDES
Effect of fuel-air-ratio nonuniformity on emissions of nitrogen oxides
[NASA-TP-1798] N82-13143
Pilot-scale development of a low-NOx coal-fired tangential system
[PB81-242513] N82-13270
Testing and evaluation of MHD materials and substructures
[DE81-024331] N82-13926
NITROUS OXIDES
Catalytic combustion of residual fuels
[NASA-TM-82731] N82-13504
The nitrogen cycle and heat budget of a subtropical lagoon, Devils Hole, Harrington Sound, Bermuda: Implications for nitrous oxide production and consumption in marine environments N82-13611
NOCTURNAL VARIATIONS
Investigation of fluctuation phenomena in dye lasers N82-13419
NOISE MEASUREMENT
Determination of two-stroke engine exhaust noise by the method of characteristics
[NASA-TM-84061] N82-13827
The influence of pressure waves on measurements of high speed train noise --- high pass filtering of pressure waves
[DFVLR-FB-81-06] N82-13837
NOISE SPECTRA
Transport noise arising from diffusion and bulk or surface generation recombination in semiconductors N82-13963
NOISE TEMPERATURE
Microwave attenuation and brightness temperature due to the gaseous atmosphere: A comparison of JPL and CCIR values
[NASA-CR-165027] N82-13300
NOISE THRESHOLD
Some experimental design techniques in image processing problems N82-13782
NONDESTRUCTIVE TESTS
A preliminary analysis of the data from experiment 77-13 and final report on glass fining experiments in zero gravity
[NASA-CR-161884] N82-13154
Acoustic nondestructive evaluation of microstructure --- pure copper and plain carbon and low alloy steels N82-13211
Optical scanner system for internal inspection of steam-generator tubes
[EPRI-NP-1944] N82-13884
NONLINEAR EQUATIONS
A method for accelerating convergence to the solution of nonlinear structural equations by reducing residual work N82-13439
Inelastic overload analysis of continuous steel multi-girder highway bridges by the finite-element method N82-13440
An extension to N dimensions of the Von Karman equations N82-13441
Algorithms for the geometry of semi-algebraic sets N82-13763
NONLINEAR OPTICS
Three laser experiments in gases N82-13416
Nonlinear optical effects in liquid crystals N82-13937
NONLINEAR SYSTEMS
MAGNA: A finite element program for the materially and geometrically nonlinear analysis of three-dimensional structures subjected to static and transient loading
[AD-A099454] N82-13448
A nonlinear conservation law with memory --- history boundary value problems in viscoelastic motion
[AD-A103882] N82-13791
Ultraviolet structure of supersymmetric non-linear sigma-models N82-13843
NONLINEARITY
Nonlinear waves in rods
[AD-A101333] N82-13447
NONPARAMETRIC STATISTICS
New optimization research
[AD-A104864] N82-13793
Error bounds for reconstruction of a function f from a finite sequence (SGN(ft sub i) + x sub i))
[AD-A104477] N82-13795
NONUNIFORM FLOW
Effect of fuel-air-ratio nonuniformity on emissions of nitrogen oxides
[NASA-TP-1798] N82-13143
NONUNIFORM PLASMAS
Energy and momentum deposition to plasmas due to the lower hybrid wave by a finite source
[IPPJ-546] N82-13899
NORTH CAROLINA
Aircraft data summaries of the SURE intensives, volume 4
[DE82-900311] N82-13569
NORWAY
High latitude measurements of the Total Electron Content (TEC) using the Faraday technique and comparisons with TEC estimates from NAVSTAR-GPS data
[AD-A103042] N82-13603
NOSE CONES
The transonic flow field for a fluidic-generator fuze assembly
[AD-A099616] N82-13388
NOSE INLETS
Thrust modulation methods for a subsonic V/STOL aircraft
[NASA-TM-82747] N82-13112
NOTCH STRENGTH
An investigation of notch low cycle fatigue life behavior of Rene' 80 at high temperature N82-13214
NOTCH TESTS
Cyclic strain approach to fatigue in metals N82-13285
NOVA LASER SYSTEM
Beam propagation in the frequency-converted subsystems of Nova and Novette
[DE81-028253] N82-13862
NOZZLE DESIGN
Integration of advanced exhaust nozzles N82-13075
The subsonic performance of practical military variable area convergent nozzles N82-13076
Advanced exhaust nozzle technology N82-13078
A numerical investigation of exhaust plume temperature effects on nonaxisymmetric nozzle/afterbody performance N82-13079
Controlled overspray spray nozzle
[NASA-CASE-MFS-25139-1] N82-13376
NOZZLE EFFICIENCY
Comparison of different nozzle concepts for a reheated turbofan N82-13077
Advanced exhaust nozzle technology N82-13078
A numerical investigation of exhaust plume temperature effects on nonaxisymmetric nozzle/afterbody performance N82-13079
NOZZLE FLOW
Navier-Stokes solutions for a supersonic coflowing axisymmetric nozzle with a thick annulus N82-13101
A study of the formation and structure of small clusters of noble gases and sulfur hexafluoride formed in Laval Nozzle molecular beams N82-13201
Experimental and analytical investigation of a fluidic power generator
[JPL-PUB-81-100] N82-13386
Flow characteristics of a multiple nozzle exhaust gas eductor system
[AD-A104072] N82-13387
NOZZLE GEOMETRY
The subsonic performance of practical military variable area convergent nozzles N82-13076
NOZZLE THRUST COEFFICIENTS
Thrust modulation methods for a subsonic V/STOL aircraft
[NASA-TM-82747] N82-13112
NUCLEAR BINDING ENERGY
A correlated treatment of bound-continuum transitions within the electron propagator formalism N82-13869
NUCLEAR EXPLOSIONS
Time domain waveform inversion of short-period p-waves for nuclear explosion source time functions
[AD-A101123] N82-13598
NUCLEAR INTERACTIONS
Inclusive charged particle spectrum from the interaction of nuclei with intermediate energy proton N82-13848
NUCLEAR MAGNETIC RESONANCE
Synthetic fuel aromaticity and staged combustion
[DE81-024205] N82-13246
NUCLEAR MODELS
Ultraviolet structure of supersymmetric non-linear sigma-models N82-13843
NUCLEAR PHYSICS
Nuclear slab collision in a relativistic quantum field theory
[DE81-026132] N82-13972
NUCLEAR PUMPING
Large volume multiple-path nuclear pumped laser
[NASA-CASE-LAR-12592-1] N82-13415
NUCLEAR RADIATION
Titanium response to a nuclear radiation environment
[AD-A102516] N82-13220
NUCLEAR REACTIONS
Study of the neutron-proton interaction in the 300-700 MeV energy region
[DE81-026733] N82-13859
Driving force of the ballooning instability
[DE81-023099] N82-13923

NUCLEAR RESEARCH
Fiber optic quality assurance at the Nevada Test Site
[DE81-028740] N82-13890
NUCLEAR SCATTERING
Inelastic scattering of high energy muons from nuclear targets N82-13874
NUCLEATION
Strain-induced crystallization of polymers N82-13239
NUCLEON-NUCLEON INTERACTIONS
Study of the neutron-proton interaction in the 300-700 MeV energy region
[DE81-026733] N82-13859
NUCLIDES
Specific gamma-ray dose constants for nuclides important to dosimetry and radiological assessment
[DE81-031980] N82-13863
NUMERICAL ANALYSIS
A numerical study of laminar unsteady compressible flow over airfoils N82-13099
A simplified two-dimensional numerical analysis of MOS devices including transient penomena N82-13372
Separate numerical treatment of attached and detached flow regions in general viscous flows N82-13375
Numerical methods for the analysis of fluid-structure interaction problems N82-13381
Computation of unsteady two-dimensional inviscid flow in turbomachinery cascades N82-13401
Mixing of a passive scalar in isotropic and sheared homogeneous turbulence N82-13405
Proceedings of the 1981 Army Numerical Analysis and Computers Conference
[AD-A103175] N82-13727
Algorithms for the geometry of semi-algebraic sets N82-13763
Generation of orthogonal and nearly orthogonal boundary-fitted coordinates with direct control of grid spacing
[LOG-J12610] N82-13790
NUMERICAL CONTROL
An approach for numerical database management N82-13731
NUMERICAL WEATHER FORECASTING
National Weather Service public forecast verification
[PB81-231714] N82-13632
Some mean characteristics of Central North Pacific tropical cyclones
[PB81-230492] N82-13634
Atmospheric dispersion forecasts at selected locations in the United States
[PB81-230443] N82-13635
NUSSELT NUMBER
Energetics and dynamics of droplet evaporation in high temperature intermediate Reynolds number flows N82-13379

O

OBSERVATORIES
Observing facilities at the European Southern Observatory (ESO) in Chile for cometary observations N82-14006
OCCURRENCES
Recurrence intervals and recency of faulting along the San Gregorio fault zone, San Mateo County, California N82-13581
OCEAN BOTTOM
Acoustical properties of sediments
[AD-A103726] N82-13638
OCEAN DATA ACQUISITIONS SYSTEMS
The SACLANTCEN oceanographic data base. Volume 1: Design criteria and data structure and content
[AD-A103277] N82-13639
ICAPS oceanographic data for the Indian Ocean
[AD-A103173] N82-13641
OCEAN MODELS
A review of one-dimensional oceanic mixed-layer models
[AD-A103279] N82-13640
On the inadequacy of one dimensional ocean models for the global carbon cycle
[CM-51] N82-13643
OCEAN SURFACE
Biological and physical oceanographic observations pertaining to the trawl fishery in a region of persistent coastal upwelling
[NASA-TM-81332] N82-13637
Surface signs of internal ocean dynamics
[AD-A101380] N82-13642
Acoustic boundary wave generation and shadowing at a seamount
[AD-A104594] N82-13832
OCEAN TEMPERATURE
Biological and physical oceanographic observations pertaining to the trawl fishery in a region of persistent coastal upwelling
[NASA-TM-81332] N82-13637
ICAPS oceanographic data for the Indian Ocean
[AD-A103173] N82-13641
OCEAN THERMAL ENERGY CONVERSION
Numerical experiments on two-phase liquid-vapor mist transport N82-13402
OCEANOGRAPHY
A summary of the Naval Postgraduate School Research Program
[AD-A104112] N82-13975
OFF-ON CONTROL
Development, analysis and control of the inductor-converter bridge N82-13349
OFFSHORE ENERGY SOURCES
Environmental assessment of the Alaskan Continental Shelf: Annual reports of principal investigators for the year ending March 1980. Volume 5: Hazards
[PB81-225732] N82-13607
OFFSHORE REACTOR SITES
Alternate hybrid power sources for remote site applications
[AD-A099471] N82-13512
OGIVES
Crossflow effects on steady and fluctuating pressures on an ogive-cylinder cone-frustum model in supersonic separated flow
[NASA-TP-1951] N82-13108
OHIO
Aircraft data summaries of the SURE intensives, volume 4
[DE82-900311] N82-13569
OIL RECOVERY
Microemulsions, emulsions and related systems: Energy applications N82-13545
OMNIDIRECTIONAL ANTENNAS
Some properties of the radiating aperture superdirectionality N82-13312
ON-LINE PROGRAMMING
On-line computers in fatigue testing N82-13279
ONBOARD DATA PROCESSING
On-board data recorder for hard-target weapons
[DE81-028645] N82-13408
OPENINGS
An integral equation method for cutout problems in shells N82-13459
OPERATING COSTS
A new approach to modeling the cost of ownership for aircraft systems
[AD-A104434] N82-13979
OPERATING SYSTEMS (COMPUTERS)
Computer-automated controls for superconducting magnetic energy storage
[DE81-028697] N82-13521
OPERATIONAL PROBLEMS
Issues related to line-oriented flight training N82-13124
Low-Btu gasification of coal for electric power generation, phase 1, 2, and 3
[DE81-029482] N82-13248
The message processing and distribution system development
[AD-A104585] N82-13333
OPERATIONS RESEARCH
Solving multiactivity multifacility capacity-constrained 0-1 assignment problems
[AD-A102583] N82-13796
Measures of effectiveness of transportation systems management
[PB81-233884] N82-13984
OPERATOR PERFORMANCE
Group 3: Performance evaluation and assessment N82-13133
A study on task difficulty and acceleration stress N82-13668
Research issues in implementing remote presence in teleoperator control N82-13676
Two-D results on human operator perception N82-13697
Modeling human tracking error in several different anti-tank systems N82-13699
On the internal target model in a tracking task N82-13700
Experimental results with a six-degree-of-freedom force-reflecting hand controller N82-13707
Manual control analysis of drug effects on driving performance N82-13709
Human supervision and microprocessor control of an optical tracking system N82-13715
A theory of human error N82-13716
Stability analysis of automobile driver steering control N82-13717
Detecting human operator impairment with a psychomotor task N82-13718
A comparison of head and manual control for a position-control pursuit tracking task N82-13720
Interruption as a test of the user-computer interface N82-13721
A model for the control mode man-computer interface dialogue N82-13722
An information processing model for predicting error detection and correction: An analysis of operator performance
[AD-A105079] N82-13733
OPTICAL COMMUNICATION
Fiber optics (optical waveguides) technology: Potential application in the DCS
[AD-A104740] N82-13303
Antenna (selected articles)
[AD-A106474] N82-13311
Solution of the problem of the synthesis of antennas with the aid of a coherent optical system N82-13313
Three-5 heterostructure avalanche photodiode modules for fiber optic communication links in the 1.0 to 1.3 micrometer spectral range
[AD-A099506] N82-13334
Short-range communications using diffusely scattered infrared radiation N82-13344
Atmospheric 222Rn measurements at San Nicolas Island during 1980
[AD-A104802] N82-13602
Time dependent recording of images transmitted over optical fibers
[DE81-026599] N82-13889
OPTICAL HETERODYNING
Experimental study of heterodyne photodetection. Perspectives for applications to optical transmission
[ENST-E-80013] N82-13892
OPTICAL MEASUREMENT
Evaluation of HALO deconvolution schemes
[AD-A105125] N82-13878
OPTICAL MEASURING INSTRUMENTS
New ways of looking for phase transitions at multi-megabar dynamic pressures
[DE81-028771] N82-13223
OPTICAL PATHS
Antenna (selected articles)
[AD-A106499] N82-13323
A statistical analysis of irregular quasi-optical lines (beam guides) with the aid of computer(s) N82-13324
Large volume multiple-path nuclear pumped laser
[NASA-CASE-LAR-12592-1] N82-13415
OPTICAL PROPERTIES
Laboratory measurements of physical, chemical, and optical characteristics of Lake Chicot sediment waters
[NASA-TP-1941] N82-13468
OPTICAL RESONANCE
Theory and calculation of Raman line shapes and excitation profiles near a one photon resonance N82-13866
OPTICAL RESONATORS
Open resonators, formed by confocal mirrors with the variable reflection coefficient and the generalized hyper-spheroidal functions N82-13315
OPTICAL SCANNERS
Optical scanner system for internal inspection of steam-generator tubes
[EPRI-NP-1944] N82-13884
OPTICAL TRACKING
Experimental investigation of a helmet mounted sight/display for helicopter N82-13080

Results and experience with a small multipurpose tracking simulator N82-13153
The cognitive demands of second order manual control: Applications of the event related brain potential N82-13667
A study on task difficulty and acceleration stress N82-13668
Subjective rating scales as a workload N82-13669
Physiological assessment of operator workload during manual tracking. 1: Pupillary responses N82-13670
Some effects of Field Of View (FOV) and target size on lateral tracking at hover N82-13672
Using rewards and penalties to obtain desired subject performance N82-13684
Two-D results on human operator perception N82-13697
Computer aided manual tracking N82-13705
Human supervision and microprocessor control of an optical tracking system N82-13715

OPTICAL WAVEGUIDES
Fiber optics (optical waveguides) technology: Potential application in the DCS [AD-A104740] N82-13303
Long-term operation of a sealed waveguide CO sub 2 laser [AD-A105261] N82-13420
Single mode optical waveguide design investigation [AD-A098979] N82-13881

OPTIMAL CONTROL
An analytical approach for predicting pilot induced oscillations N82-13688
A model for the submarine depthkeeping team N82-13689
On the use of the OCM's quadratic objective function as a pilot rating metric N82-13693
A quasi-Newton procedure for identifying pilot-related parameters of the optimal control model N82-13694
Information and display requirements for aircraft terrain following N82-13695
On the internal target model in a tracking task N82-13700
A model of the human observer and decision maker N82-13714
A comparison of head and manual control for a position-control pursuit tracking task N82-13720
Computer implementation of optimal multivariable controller design in the frequency domain N82-13785

OPTIMIZATION
Optimum Design of Static, Earthquake, and Wind Steel Structures (ODSEWS-2D) [PB81-232738] N82-13271
Geometric programming for engineering design optimization N82-13288
Synthesis of nonequidistant line-source antenna by the statistical methods of search N82-13329
Query optimization by semantic reasoning N82-13762
New optimization research [AD-A104864] N82-13793
Solving multiactivity multifaciliity capacity-constrained 0-1 assignment problems [AD-A102583] N82-13796
Transforming contingency tables [AD-A104182] N82-13821
Fiber optic time domain reflectometers: Approaches to performance improvement N82-13893
Enhanced-confinement class of stellarators [DE81-028727] N82-13924

ORBIT SPECTRUM UTILIZATION
Technical basis for efficient management of geostationary satellite orbit/spectrum N82-13159

ORBIT TRANSFER VEHICLES
Low-thrust chemical propulsion system pump technology [NASA-CR-165219] N82-13427

ORBITAL LAUNCHING
Concept and feasibility study (phase A) for the X-ray satellite ROBISAT. Executive summary [BMFT-FB-W-80-027] N82-13164

ORBITAL POSITION ESTIMATION
Astrometric observations of comets and asteroids and subsequent orbital investigations [NASA-CR-165004] N82-14039

OREGON
Infiltration and indoor air quality in energy efficient houses in Eugene, Oregon [DE82-000971] N82-13561

ORGANIC COMPOUNDS
A study of the surface reactivity of silver: An acid base characterization of oxidation reactions N82-13233
Concentration of organic compounds in water: A literature survey [DE81-026517] N82-13556
Analytical detection of organic species by means of laser-induced multiphoton ionization N82-13646
Metabolism summaries of selected halogenated organic compounds in human and environmental media, a literature survey: First update [PB81-232811] N82-13655

ORGANIC WASTES (FUEL CONVERSION)
Biomass energy systems: Descriptions and employment requirements for typical operations [DE82-000236] N82-13538

ORIFICE FLOW
The relationship between the acoustic impedance and unsteady flow field near the orifice of a two dimensional Helmholtz resonator in grazing flow N82-13378

ORTHOGONAL FUNCTIONS
The formation of radiation patterns of arc antennas N82-13305
Two-D results on human operator perception N82-13697

ORTHOGONALITY
Generation of orthogonal and nearly orthogonal boundary-fitted coordinates with direct control of grid spacing [LOG-J12610] N82-13790

OSCILLATING FLOW
Experimental and analytical investigation of a fluidic power generator [JPL-PUB-81-100] N82-13386

OSCILLATIONS
Analysis of a longitudinal pilot-induced oscillation experienced on the approach and landing test of the space shuttle [NASA-TM-81366] N82-13149
An analytical approach for predicting pilot induced oscillations N82-13688
Pattern of neutrino mixing in grand unified theories [DE81-029034] N82-13872

OVERPRESSURE
Soviet UCG experience specifically related to field experiments in the United States [DE81-028642] N82-13244
Electronic measurement of airblast overpressure [AD-A105379] N82-13389

OVERVOLTAGE
Distributed photovoltaic systems: Utility interface issues and their present status [NASA-CR-165019] N82-13492

OXIDATION
Quantitative investigations of mixed oxidation states of some first row transition metals in insulator matrices by photoelectron spectroscopy N82-13184
A study of the surface reactivity of silver: An acid base characterization of oxidation reactions N82-13233

OXIDATION-REDUCTION REACTIONS
Electrochemical and spectroscopic studies of some less stable oxidation states of selected lanthanide and actinide elements N82-13182
Spectroelectrochemical investigations in molten salt and aqueous media N82-13183
Treatment of biomass-gasification wastewaters by wet-air oxidation [DE82-000935] N82-13567

OXIDE FILMS
Energy levels in and on an oxide film as measured by electrochemical methods [AD-A103704] N82-13187
Mathematical model of differential reflectometry for use in the investigation of thin film corrosion products N82-13232

OXIDES
Investigation into the role of NaCl deposited on oxide and metal substrates in the initiation of hot corrosion [NASA-CR-165029] N82-13217

OXYGEN
Solubilities of dissolved gases in sea water [AD-A100675] N82-13189
Oxygen transport and line emissions in a tokamak plasma [IPPJ-544] N82-13900

OXYHEMOGLOBIN
Resonance Raman spectroscopic investigations of the active site structures of hemoglobin and hemerythrin N82-13176

OZONE
An automated system for global atmospheric sampling using B-747 airliners [NASA-CR-165264] N82-13554
SAM 2 measurements of the polar stratospheric aerosol, volume 1: October to April 1979 [NASA-RP-1081] N82-13592

P

P WAVES
Time domain waveform inversion of short-period p-waves for nuclear explosion source time functions [AD-A101123] N82-13598

PACIFIC NORTHWEST (US)
Wind Power: Research on network wind power over the Pacific northwest. Executive summary [DE81-029360] N82-13519

PACIFIC OCEAN
Deep Ocean Mining Environmental Study. Environmental effects of commercial-scale mining [PB81-227753] N82-13484
Some mean characteristics of Central North Pacific tropical cyclones [PB81-230492] N82-13634
Annual data and verification tabulation, eastern North Pacific tropical storms and hurricanes 1980 [PB81-230336] N82-13636

PACKETS (COMMUNICATION)
Flow control and routing in an integrated voice and data communication network [AD-A103342] N82-13337

PAIR PRODUCTION
The hadronic decay rate of the Higgs boson: An application of the running mass N82-13842

PANEL METHOD (FLUID DYNAMICS)
A numerical method for studying nacelle-jet-airfoil interaction in inviscid three-dimensional flow N82-13094

PARABOLIC ANTENNAS
Two-mirror antenna for radio relay communication N82-13308
Use of principle of regularization in direct and mixed problems of the theory of the synthesis of radiating systems N82-13309
Synthesis of a plane system of discrete emitters N82-13310

PARALLEL COMPUTERS
Introduction to the configurable highly parallel computer, revision [AD-A099776] N82-13735
Parallel scheduling algorithms [AD-A103796] N82-13820

PARALLEL PROCESSING (COMPUTERS)
Distributed and decentralized control in fully distributed processing systems [AD-A104379] N82-13739
A difference in efficiency between synchronous and asynchronous systems [AD-A102280] N82-13742
Complexity of communication among asynchronous parallel processes N82-13760
Design of a real time, interactive, parallel simulation computer N82-13781
Parallel scheduling algorithms [AD-A103796] N82-13820

PARAMETER IDENTIFICATION
System identification helicopter parameters. Determination from flight tests, phase 2 [BMVG-FBWT-80-12] N82-13137
Rapid cycle casting of steel [AD-A103567] N82-13260
Time domain waveform inversion of short-period p-waves for nuclear explosion source time functions [AD-A101123] N82-13598
A quasi-Newton procedure for identifying pilot-related parameters of the optimal control model N82-13694
A data collection scheme for identification of parameters in a driver model N82-13696

Confidence intervals for the reliability of a future system configuration
[AD-A105031] N82-13814
An upper asymptote for the three-parameter logistic item-response model
[AD-A103013] N82-13816
Molecular beam electric resonance studies of weakly bound complexes N82-13867

PARAMETERIZATION
Spectrometric properties of crystals for low-energy X-ray diagnostics
[DE81-028763] N82-13954

PARSING ALGORITHMS
Preliminary analysis of a breadth-first parsing algorithm: Theoretical and experimental results
[AD-A101852] N82-13797

PARTICLE ACCELERATION
Two-satellite study of proton drift on quiet days
[AD-A104736] N82-13601

PARTICLE COLLISIONS
Two-photon physics as a probe of hadron dynamics
[DE81-028757] N82-13858
HETFIS: High-energy nucleon-meson transport code with fission
[DE81-027674] N82-13873

PARTICLE DENSITY (CONCENTRATION)
Bipolar conduction with AC excitation N82-13373
Results to be expected from light scattering dust analyzer during a rendezvous mission N82-13999

PARTICLE DIFFUSION
A comparative study of classical and quantal approaches to thermal and diffusive transport in a dilute atom-diatom binary mixture N82-13868

PARTICLE INTERACTIONS
Pattern of neutrino mixing in grand unified theories
[DE81-029034] N82-13872

PARTICLE MASS
The hadronic decay rate of the Higgs boson: An application of the running mass N82-13842
Pattern of neutrino mixing in grand unified theories
[DE81-029034] N82-13872

PARTICLE PRODUCTION
HETFIS: High-energy nucleon-meson transport code with fission
[DE81-027674] N82-13873
Problems in quantum mechanics and gravitation N82-13970

PARTICLE SIZE DISTRIBUTION
Deposition of aerosol particles in the human respiratory tract N82-13659

PARTICLE THEORY
The hadronic decay rate of the Higgs boson: An application of the running mass N82-13842
Ultraviolet structure of supersymmetric non-linear sigma-models N82-13843

PARTICLE TRAJECTORIES
Regularized integration of gravity-perturbed trajectories: A numerical efficiency study N82-13155

PARTICULATE SAMPLING
The trace metal stratigraphy and recent sedimentary history of anthrogenous particulates on the San Pedro Shelf, California N82-13579

PASCAL (PROGRAMMING LANGUAGE)
Software design and documentation language: User's guide for SDDL release 4
[NASA-CR-165025] N82-13767

PASSIVITY
Fundamental studies of grain-boundary passivation in polycrystalline silicon with application to improved photovoltaic devices
[DE82-000825] N82-13956

PATTERN RECOGNITION
Structure of the knowledge base for an expert labeling system N82-13723
Symbolic reasoning among 3-D models and 2-D images N82-13761
Computer vision
[NASA-CR-165012] N82-13768
Some experimental design techniques in image processing problems N82-13782

PATTERN REGISTRATION
Multi-sensor image registration N82-13755

PAVEMENTS
Construction of a recycled Portland cement concrete pavement --- Connecticut expressway
[PB81-233553] N82-13267
Measured pavement response to transient aircraft loadings N82-13442

PDP COMPUTERS
Playbk-routines to drive a digital-to-analog converter
[AD-A102049] N82-13741
Digital Equation Corporation PDP-11 COBOL, version 4.1
[PB81-232423] N82-13746
Digital equipment corporation, PDP-11 COBOL version, 4.1 indexed 1-0 module
[PB81-232415] N82-13747

PEARLITE
Cyclic deformation and fatigue microcrack initiation in pearlitic eutectoid steel N82-13230

PEAT
Development of peatlands in northern Minnesota
[DE82-000873] N82-13475

PECLET NUMBER
Thermoelastic instability in a seal-like configuration N82-13436

PENNSYLVANIA
Aircraft data summaries of the SURE intensives, volume 5
[DE82-900310] N82-13570

PERCEPTUAL ERRORS
A theory of human error N82-13716

PERFORMANCE PREDICTION
Application of a gravity-driven wickless heat pipe for ice production in a cold energy storage system N82-13377

PERFORMANCE TESTS
Performance of chemical analogs of the explosive CP
[DE81-025836] N82-13251
AC harmonic filtering using controlled current injection N82-13348
Validation, modeling, and computer assisted design program for power converters --- confirmation of dc/dc converters predicted performance
[ESTEC/DERA-8/7208] N82-13370
Passive/hybrid solar components: An approach to standard thermal test methods
[PB81-227886] N82-13549
Concurrent testing and checking in computer systems N82-13751

PERIODIC FUNCTIONS
Energy characteristics of periodic systems of radiators: Efficiency and output coefficient of power, directive gain, and gain factor N82-13306

PERIODIC VARIATIONS
Network wind power over the Pacific northwest. Appendix 1: Wind statistics summaries for the wind power data stations
[DE81-029291] N82-13518

PERMEABILITY
Studies of natural fractures, fault zone permeability, and a pore space-permeability model N82-13616

PERMITTIVITY
Conductivity and permittivity measurements of fast ion conductors in the microwave region N82-13351

PERSONNEL MANAGEMENT
Eastern Airlines LOFT program N82-13127
Group 3: Performance evaluation and assessment N82-13133

PERSONNEL SELECTION
Weighting of aptitude components based on differences in technical school difficulty
[AD-A102045] N82-13725

PERTURBATION
Rayleigh-Taylor stability for a shock wave-density discontinuity interaction
[DE81-028707] N82-13394

PERTURBATION THEORY
Ultraviolet structure of supersymmetric non-linear sigma-models N82-13843
Relativistic many-body perturbation theory of parity-violation in atoms N82-13845
Compton scattering in a uniform, constant magnetic field N82-13968

PETROLOGY
Petrology and geochemistry of ophiolite fragments in a tectonic melange, Kodiak Islands, Alaska N82-13610

PHASE CHANGE MATERIALS
New ways of looking for phase transitions at multi-megabar dynamic pressures
[DE81-028771] N82-13223

PHASE CONTRAST
Phase measurments in the focal region of an aberrated lens N82-13875

PHASE ERROR
Possibilities of phase correction on the small reflector in a two-reflector antenna N82-13322

PHASE MODULATION
Beam propagation in the frequency-converted subsystems of Nova and Novette
[DE81-028253] N82-13862

PHASE SHIFT
Schwinger's variational principle for electron-ion scattering N82-13844

PHASE TRANSFORMATIONS
Properties of matter at ultra-high pressures
[DE81-026504] N82-13190
Strengthening phases and deformation mechanisms in dispersion strengthened solid solutions and pure metals N82-13229
Role of molecular dynamics on descriptions of shock front processes
[DE81-028687] N82-13857
Defect studies of molecular and rare-gas crystals down to 50mK and up to 150 MPa
[DE81-026617] N82-13949

PHASED ARRAYS
Experimental and theoretical investigations with laboratory models of phased array antenna
[BMVG-FBWT-79-21] N82-13341

PHENYLS
Grafting of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole onto polymers with aliphatic groups. Synthesis and polymerization of 2 (2-hydroxy-5-isopropenylphenyl) 2H-benzotriazole and a new synthesis of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole
[NASA-CR-165016] N82-13171

PHILOSOPHY
Language, computation, and reality N82-13757

PHONONS
Raman probe of equilibrium and laser modulated populations of electrons and phonons in GaAs N82-13934

PHOSPHORIC ACID FUEL CELLS
Cell module and fuel conditioner development
[NASA-CR-165462] N82-13511

PHOSPHORUS
The structural and vibrational properties of amorphous and crystalline group V elements N82-13933

PHOTOACOUSTIC SPECTROSCOPY
Double beam-in-time photoacoustic spectroscopy N82-13180

PHOTOCHEMICAL REACTIONS
Rate coefficients of combustion/fuel conversion reactions by high-temperature photochemistry
[DE81-027965] N82-13192
Spectroelectrochemistry, flash photolysis and photogalvanic effect of methylene blue and safranin-0 N82-13208
Laboratory Research --- spectroscopic analysis, photochemical reactions, and proton irradiation of ice N82-14022

PHOTOCONDUCTORS
Imaging systems for fast electrophotographic processes
[BMFT-FB-T-80-183] N82-13411

PHOTODIODES
Three-5 heterostructure avalanche photodiode modules for fiber optic communication links in the 1.0 to 1.3 micrometer spectral range
[AD-A099506] N82-13334

PHOTODISSOCIATION
Laboratory measurements of the cometary photochemical phenomena N82-14023

PHOTOELECTRIC EMISSION
Deformation-enhanced photoemission from metals N82-13231
Investigation of photoacoustorefractive effect in LiNbO sub 3 SAW devices
[AD-A103705] N82-13880

PHOTOELECTRON SPECTROSCOPY
Quantitative investigations of mixed oxidation states of some first row transition metals in insulator matrices by photoelectron spectroscopy N82-13184

PHOTOGRAPHIC FILM
Antenna (selected articles)
[AD-A106499] N82-13323
One use of methods of the statistical theory of antennas N82-13325

PHOTOGRAPHS
Photographic observations of comets at Lowell Observatory --- Halley's comet N82-14016

Existing cometary data and future needs N82-14017
Catalog of lunar mare basalts greater than 40 grams. Part 1: Major and trace chemistry, with megascopic descriptions and rock and thin section photographs [NASA-TM-84065] N82-14040

PHOTOIONIZATION
Studies of photoionization in liquids using a laser two-photon ionization conductivity technique [DE81-026514] N82-13194

PHOTOLYSIS
Rate coefficients of combustion/fuel conversion reactions by high-temperature photochemistry [DE81-027965] N82-13192
Spectroelectrochemistry, flash photolysis and photogalvanic effect of methylene blue and safranin-0 N82-13208
Laboratory measurements of the cometary photochemical phenomena N82-14023

PHOTOMETERS
Experimental study of heterodyne photodetection. Perspectives for applications to optical transmission [ENST-E-80013] N82-13892

PHOTOMETRY
Introductory remarks: Photometry section N82-13996
Results to be expected from light scattering dust analyzer during a rendezvous mission N82-13999
Observing facilities at the European Southern Observatory (ESO) in Chile for cometary observations N82-14006
Intermediate band surface photometry of elliptical galaxies N82-14035

PHOTON BEAMS
Double beam-in-time photoacoustic spectroscopy N82-13180
Theory and calculation of Raman line shapes and excitation profiles near a one photon resonance N82-13866

PHOTON DENSITY
Investigation of fluctuation phenomena in dye lasers N82-13419

PHOTONS
Studies of photoionization in liquids using a laser two-photon ionization conductivity technique [DE81-026514] N82-13194
Camelot: A novel concept for a multiterawatt pulse power generator for single pulse burst or repetition rate operation [AD-A103024] N82-13513
Two-photon physics as a probe of hadron dynamics [DE81-028757] N82-13858

PHOTOSYNTHESIS
Response of the oceans to increasing atmospheric carbon dioxide [DE81-028178] N82-13558

PHOTOVOLTAIC CELLS
Space applicable DOE photovoltaic technology: An update [NASA-CR-165021] N82-13491
Distributed photovoltaic systems: Utility interface issues and their present status [NASA-CR-165019] N82-13492
A Module Experimental Process System Development Unit (MEPSDU) [NASA-CR-165014] N82-13496
Intermediate photovoltaic system application experiment operational performance report. Volume 2 for Beverly High School, Beverly, Mass. [DE82-000811] N82-13532
Experimental and analytical systems studies of a combined thermal-photovoltaic residential solar system [DE81-029539] N82-13534

PHOTOVOLTAIC CONVERSION
Data report for the northeast residential experiment station, June 1981 --- photovoltaic systems [DE82-000068] N82-13533

PHOTOVOLTAIC EFFECT
Fundamental studies of grain-boundary passivation in polycrystalline silicon with application to improved photovoltaic devices [DE82-000825] N82-13956

PHYSIOLOGICAL RESPONSES
Influence of sine, and random, whole-body vibration on visual acuity [BMVG-FBWT-79-17] N82-13653

PIGMENTS
Resonance Raman spectroscopic investigations of the active site structures of hemoglobin and hemerythrin N82-13176

PILOT PERFORMANCE
Monocular vision and tactical flight on the helicopter N82-13059
Evaluation of a pilot workload assessment device to test alternate display formats and control handling qualities N82-13062
An investigation into pilot and system response to critical in-flight events, volume 1 [NASA-CR-166243-VOL-1] N82-13662
An investigation into pilot and system response to critical in-flight events, volume 2 [NASA-CR-166243-VOL-2] N82-13663
Visual/motion cue mismatch in a coordinated roll maneuver [NASA-CR-166259] N82-13664
Multiple man-machine interfaces N82-13682
Decision aids for airborne intercept operations in advanced aircrafts N82-13683
A comparison of landing maneuver piloting technique based on measurements made in an airline training simulator and in actual flight N82-13685
Identification of multiloop pilot describing functions obtained from simulated approaches to an aircraft carrier N82-13686
An analytical approach for predicting pilot induced oscillations N82-13688
Comparison of closed loop model with flight test results N82-13691
A quasi-Newton procedure for identifying pilot-related parameters of the optimal control model N82-13694
Theoretical linear approach to the combined man-manipulator system in manual control of an aircraft N82-13702
The influence of ship motion of manual control skills N82-13703
The role of manipulator characteristics in selecting the ideal effective vehicle N82-13704
Computer aided manual tracking N82-13705
Pilot scanning patterns while viewing cockpit displays of traffic information N82-13710

PILOT PLANTS
Controlled-flash pyrolysis [DE82-000284] N82-13196
Low-Btu gasification of coal for electric power generation, phase 1, 2, and 3 [DE81-029482] N82-13248
Pilot-scale development of a low-NOx coal-fired tangential system [PB81-242513] N82-13270

PILOT TRAINING
Texas International Airlines LOFT program N82-13128
Delta Airlines LOFT training N82-13129
American Airlines LOFT evaluation program N82-13130
Group 2: Real time LOFT operations N82-13132
Results and experience with a small multipurpose tracking simulator N82-13153

PIPE FLOW
An initial study of the application of the numerical method of characteristics to unsteady flow analysis in partially filled gravity drainage sized pipes [PB81-229189] N82-13399

PIPES (TUBES)
Substructure of 316 stainless steel pipe weldments --- liquid metal fast breeder reactor materials N82-13215
Workshop proceedings: Corrosion of Inconel 600 Steam Generator Tubing in the Tubesheet Crevice [DE81-903554] N82-13226
Hydrodynamic computations of pressures generated by steam pipe rupture [AD-A102046] N82-13449
Residual stress and deformation in circumferential pipe-joint welds [PB81-232464] N82-13458
Optical scanner system for internal inspection of steam-generator tubes [EPRI-NP-1944] N82-13884

PITCHING MOMENTS
A calculation method for slender wing-body configurations in supersonic flow at high angles of attack --- nonlinear force and pitching moment characteristics [BMVG-FBWT-79-15] N82-13115

PITOT TUBES
Effects of intake geometry on circular pitot intake performance at zero and low forward speeds N82-13070
Influence of wall roughness, adverse pressure gradient and heat transfer on wall shear stress measurements with Preston tubes [ILR-50] N82-13396

PLANE WAVES
Pressure measurements of non-planar stress waves --- dual element strain gage [DE81-028729] N82-13454

PLANETARY ATMOSPHERES
Infrared experiments for spaceborne planetary atmospheres research. Full report [NASA-TM-84414] N82-13876
Infrared experiments for spaceborne planetary atmospheres research. Executive summary [NASA-TM-84413] N82-13877

PLANETARY GEOLOGY
Reports of Planetary Geology Program, 1981 [NASA-TM-84211] N82-14041

PLANETARY RADIATION
Planetary radio astronomy observations from Voyager-2 near Saturn [NASA-TM-83856] N82-14037
Saturnian kilometric radiation: Source locations [NASA-TM-83846] N82-14038

PLANETOLOGY
Papers presented to the Conference on the Processes of Planetary Rifting [LPI-CONTRIB-457] N82-13595

PLANETS
Astrometric observations of comets and asteroids and subsequent orbital investigations [NASA-CR-165004] N82-14039

PLANFORMS
Pressure distributions on three different cruciform aft-tail control surfaces of a wingless missile at Mach 1.60, 2.36, and 3.70. Volume 1: Trapezoidal tail [NASA-TM-80097] N82-13110

PLANT DESIGN
Low/medium Btu coal gasification assessment program for potential users in New Jersey: Executive summary [DE81-025475] N82-13247
Low-Btu gasification of coal for electric power generation, phase 1, 2, and 3 [DE81-029482] N82-13248
Residual-energy-application program: EAST facility requirements document, volume 1 [DE81-027536] N82-13526
Design procedures for a commercial scale thermal evaporation system to deposit CdS for solar cell manufacture N82-13551

PLASMA COMPRESSION
Review of recent EBT coupled ring-core stability theory N82-13911
Hot-electron ring stability at the University of Tennessee N82-13914
Analytical theory of interchange and compressional Alfven instabilities in EBT N82-13918

PLASMA CONTROL
Ion cyclotron resonance heating and its effect on confinement in Tokamaks N82-13896
The reverse-field rigid rotor model, calculation and simulation N82-13898
Toroidal plasma current sustainment by lower hybrid waves in the WT-2 Tokamak [IPPJ-545] N82-13901
Plasma focus breeder [IPPJ-541] N82-13904
Feedback plasma control in hybrid poloidal coil system [IPPJ-542] N82-13905
EBT Stability Theory: Proceedings of the workshop [DE81-030635] N82-13909
Review of recent EBT coupled ring-core stability theory N82-13911
Numerical solutions of the EBT Radial eigenmode problem N82-13916
Driving force of the ballooning instability [DE81-023099] N82-13923
Enhanced-confinement class of stellarators [DE81-028727] N82-13924

PLASMA CORE REACTORS
Numerical solutions of the EBT Radial eigenmode problem N82-13916

Effect of Beta limits on reactor performance in EBT N82-13922

PLASMA CURRENTS

The reverse-field rigid rotor model, calculation and simulation N82-13898

Soft and hard major disruptions in the profile control experiment of the JIPP T-2 Tokamak [IPPJ-547] N82-13902

Feedback plasma control in hybrid poloidal coil system [IPPJ-542] N82-13905

PLASMA DENSITY

EBT Stability Theory: Proceedings of the workshop [DE81-030635] N82-13909

PLASMA DIAGNOSTICS

Spectrometric properties of crystals for low-energy X-ray diagnostics [DE81-028763] N82-13954

PLASMA DRIFT

Microstability of the EBT boundary N82-13919

PLASMA EQUILIBRIUM

On high beta equilibria of plasmas in the quasi-uniform current model: Influence of shaping the plasma cross section and of the second order in the inverse aspect ratio [REPT-81-131] N82-13927

PLASMA FLUX MEASUREMENTS

Fluctuation measurements in EBT N82-13913

PLASMA FOCUS

Plasma focus breeder [IPPJ-541] N82-13904

PLASMA FREQUENCIES

Eigenmode stability analysis for a bumpy torus N82-13915

PLASMA HEATING

Ion cyclotron resonance heating and its effect on confinement in Tokamaks N82-13896

Energy and momentum deposition to plasmas due to the lower hybrid wave by a finite source [IPPJ-546] N82-13899

Electromagnetic cyclotron harmonic waves --- plasma heating [IPPJ-536] N82-13903

Rudimentary theories of the stability of microwave-heated plasmas N82-13910

Brief survey of experimental investigation of instabilities in microwave-heated plasmas N82-13912

PLASMA INTERACTIONS

Numerical study on the interaction between a modulated electron beam and a plasma [IPPJ-543] N82-13906

PLASMA PHYSICS

A triggering of solar flare by magnetosonic waves in a neutral sheet plasma [IPPJ-540] N82-14042

PLASMA PINCH

Plasma focus breeder [IPPJ-541] N82-13904

PLASMA SHEATHS

Fluctuation measurements in EBT N82-13913

PLASMA WAVES

Pulse propagation in dispersive media with applications to plasmas N82-13897

Numerical study on the interaction between a modulated electron beam and a plasma [IPPJ-543] N82-13906

PLASMA-ELECTROMAGNETIC INTERACTION

Data on the backscattering coefficients of light ions from solids [IPPJ-AM-18] N82-13907

PLASMAS (PHYSICS)

Studies of sample introduction for inductively coupled plasma emission spectrometry N82-13209

Fundamental studies of direct current plasmas N82-13895

EBT Stability Theory: Proceedings of the workshop [DE81-030635] N82-13909

Observational data needs for plasma phenomena N82-13992

Anticipated results from dust experiments on cometary missions N82-13993

PLASMONS

Raman probe of equilibrium and laser modulated populations of electrons and phonons in GaAs N82-13934

PLASTIC DEFORMATION

Cyclic deformation and fatigue crack initiation of a coherently precipitating Ni-14.4 at % Al alloy N82-13212

Deformation-enhanced photoemission from metals N82-13231

Moment-strain relationships in elastic-plastic bending of beams [AD-A101722] N82-13446

Elastic-plastic-fracture analysis of concrete structures N82-13462

User's manuals for DYNA3D and DYNAP: Nonlinear dynamic analysis of solids in three dimensions [DE81-028360] N82-13772

PLASTIC FLOW

Plastic flow and unstable deformation of geological materials N82-13587

PLASTIC MEMORY

A nonlinear conservation law with memory --- history boundary value problems in viscoelastic motion [AD-A103882] N82-13791

PLASTIC PROPELLANTS

Evaluation of low-chlorine TATB from a production source [DE81-025474] N82-13249

PLASTIC PROPERTIES

H-Coal product physical properties measurement [DE81-029095] N82-13245

A continuum model for friction with applications in metal forming plasticity N82-13445

Plastic flow and unstable deformation of geological materials N82-13587

PLATE THEORY

Investigation of the acoustic emission and deformation response of finite ice plates [AD-A103731] N82-13471

PLATING

Wear properties of electrodeposited titanium diboride coatings [PB81-233314] N82-13199

PLATINUM

Surface characterization of dispersed supported metal catalysts using a 'time lapse' dynamic pulse technique N82-13177

Preparation, characterization and performance of non-uniform metal catalysts N82-13204

PLENUM CHAMBERS

Wind tunnel tests of powered models: A comparison of two methods of simulating the jets of jet engines N82-13087

PLETHYSMOGRAPHY

The measurements of fluid shifts and of the tissue compliance along body axis in man [BMFT-FB-W-80-011] N82-13654

PLOTTERS

PLOT2K: A graphics interface of system 2000 [DE81-028706] N82-13774

PLOTTING

PLOT2K: A graphics interface of system 2000 [DE81-028706] N82-13774

Mesh generating and plotting facilities of the LAMCAL program [EUR-7099-EN] N82-13778

PLUMES

Proton-induced X-ray emission analysis: A complement to analytical methods used in environmental studies [DE81-029012] N82-13557

Environmental effects of pollutants from coal combustion. 1: The Four Corners Power Plant, Farmington, N.M. [PB81-230427] N82-13572

Environmental effects of pollutants from coal combustion. 2: The Colstrip, Montana Power Plant [PB81-234114] N82-13573

POINTS (MATHEMATICS)

Open resonators, formed by confocal mirrors with the variable reflection coefficient and the generalized hyper-spheroidal functions N82-13315

POISSON EQUATION

Generation of orthogonal and nearly orthogonal boundary-fitted coordinates with direct control of grid spacing [LOG-J12610] N82-13790

POLAR REGIONS

High latitude measurements of the Total Electron Content (TEC) using the Faraday technique and comparisons with TEC estimates from NAVSTAR-GPS data [AD-A103042] N82-13603

POLARIMETERS

Spectral imagery: Recent results with the SPIFI and their implications for cometary atmospheric studies --- servocontrolled polarimetric imaging Fabry-Perot interferometer N82-14011

POLARIMETRY

Introductory remarks: Photometry section N82-13996

Observing facilities at the European Southern Observatory (ESO) in Chile for cometary observations N82-14006

POLARIZATION (CHARGE SEPARATION)

Insoluble anodes for electrowinning zinc and other metals [PB81-227365] N82-13227

POLARIZED RADIATION

The transfer of polarized radiation in spectral lines from rotationally distorted stars N82-14031

POLITICS

Building a consensus about energy technologies [DE82-000501] N82-13536

POLLUTION CONTROL

Sulfur in the air in the capital (Helsinki) metropolitan area: ITASAT-project [RR-614.71] N82-13553

Concentration of organic compounds in water: A literature survey [DE81-026517] N82-13556

Environmental hazard rankings of pollutants generated in coal gasification processes [PB81-231698] N82-13576

Aircraft measurements and mathematical modeling of the removal of gaseous air pollutants at natural air-land and air-water interfaces N82-13577

POLLUTION MONITORING

Rate coefficients of combustion/fuel conversion reactions by high-temperature photochemistry [DE81-027965] N82-13192

Aircraft data summaries for the SURE intensives, volume 6 [DE82-900355] N82-13563

Tables of statistical summaries for the SURE aircraft measurements [DE82-900317] N82-13564

National Research and Development Program: Environmental air. Summary --- air pollution monitoring and modeling; effects on people and their environment N82-13571

Geophysical monitoring for climatic change, number 8: Summary Report, 1979 [PB81-233355] N82-13631

On the inadequacy of one dimensional ocean models for the global carbon cycle [CM-51] N82-13643

Detection of trace gases using high resolution spectroscopy [AD-A104841] N82-13883

POLYATOMIC MOLECULES

On the vibrational energy transfer processes of polyatomic molecules in the gas and solid phases N82-13865

POLYCRYSTALS

Fundamental studies of grain-boundary passivation in polycrystalline silicon with application to improved photovoltaic devices [DE82-000825] N82-13956

The physical and electrical properties of polycrystalline-silicon N82-13964

POLYGONS

Sequential stochastic construction of random polygons N82-13812

POLYMER PHYSICS

Studies of polymer compatibility by nonradiative energy transfer N82-13235

Strain-induced crystallization of polymers N82-13239

A study of the dynamic and transient properties of polymer solutions N82-13241

POLYMERIC FILMS

Studies of polymer compatibility by nonradiative energy transfer N82-13235

Thermal performance of windows having high solar transmittance [DE81-028872] N82-13524

POLYMERIZATION

Polymers with mesomorphic organization in the side chains from vinyl monomers with mesogenic or potentially mesogenic elements N82-13234

Effect of solvents on the radiation-induced polymerization of ethyl and isopropyl vinyl ethers N82-13238

POLYNOMIALS
Algorithms for the geometry of semi-algebraic sets N82-13763

POLYTETRAFLUOROETHYLENE
Study of methods for applying and enhancing transfer film coatings of polytetrafluoroethylene (PTEE) to Space Shuttle Main Engine (SSME) High Pressure Oxygen Turbo Pump (HPOTP) bearings
[NASA-CR-161916] N82-13428

POROSITY
Reduction of nitric oxide in a fluidized bed
[DE81-030488] N82-13198
Simultaneous heat and mass transfer in a porous medium N82-13404
Studies of natural fractures, fault zone permeability, and a pore space-permeability model N82-13616

PORTABLE EQUIPMENT
Theoretical analysis of the effects of turbulence on a mobile parametric receiver
[AD-A101418] N82-13833

POSITION (LOCATION)
SEASAT equator crossing program
[AD-A099442] N82-13156
Interpolating for the location of remote sensor data
[NASA-TM-82169] N82-13469
Cometary ephemerides - needs and concerns N82-13995

POSITRONS
Monte Carlo calculations of channeling radiation
[DE81-027655] N82-13818
Positron lifetime and Doppler broadening techniques applied to irradiation damaged silver
[DE81-028688] N82-13854

POSTLAUNCH REPORTS
Launch mission summary: Intelsat 5 (F3) Atlas/Centaur-55
[NASA-TM-84068] N82-13161

POTASSIUM
High-temperature measurements of alkali levels in an experimental 6-inch AFBC
[DE81-023632] N82-13193

POTENTIAL ENERGY
Interatomic potential energy hypersurfaces for molecules N82-13841

POTENTIAL THEORY
Molecular dynamics calculations for sodium using pseudopotential theory
[DE81-029022] N82-13853

POTTING COMPOUNDS
Investigation of test methods, material properties, and processes for solar cell encapsulants
[NASA-CR-165031] N82-13503

POWDER (PARTICLES)
Evaluation of low-chlorine TATB from a production source
[DE81-025474] N82-13249
Review of low-voltage CP detonators
[DE81-025837] N82-13250

POWER CONDITIONING
Development, analysis and control of the inductor-converter bridge N82-13349

POWER EFFICIENCY
Antenna (selected articles)
[AD-A106523] N82-13304
Energy characteristics of periodic systems of radiators: Efficiency and output coefficient of power, directive gain, and gain factor N82-13306
Intermediate photovoltaic system application experiment operational performance report. Volume 2 for Beverly High School, Beverly, Mass.
[DE82-000811] N82-13532

POWER GAIN
Antenna (selected articles)
[AD-A106523] N82-13304
Energy characteristics of periodic systems of radiators: Efficiency and output coefficient of power, directive gain, and gain factor N82-13306

POWER LINES
Cryogenic testing of 100-m superconducting power transmission test facility
[DE81-028331] N82-13517

POWER SUPPLIES
Alternate hybrid power sources for remote site applications
[AD-A099471] N82-13512

POWER SUPPLY CIRCUITS
High voltage DC switchgear development for multi-kW space power system: Aerospace technology development of three types of solid state power controllers for 200-1100VDC with current ratings of 25, 50, and 80 amperes with one type utilizing an electromechanical device
[NASA-CR-165413] N82-13357

PRECIPITATION
Five-year water resources research plan, 1982-1987
[PB81-231938] N82-13479

PRECIPITATION (METEOROLOGY)
The Sierra Cooperative Pilot Project: Precipitation management research in the Sierra Nevada
[PB81-234452] N82-13630

PRECIPITATION HARDENING
Strengthening phases and deformation mechanisms in dispersion strengthened solid solutions and pure metals N82-13229

PREDICTION ANALYSIS TECHNIQUES
Creep and creep rupture of laminated graphite/epoxy composites N82-13173
Statistical energy analysis computer program, user's guide
[NASA-CR-161913] N82-13764
Prediction of aerodynamic loads on aircrafts with external stores at transonic speeds N82-13813

PREDICTIONS
An information processing model for predicting error detection and correction: An analysis of operator performance
[AD-A105079] N82-13733

PREEMPTING
Preemptive scheduling of a multiprocessor system with memories to minimize L sub max
[AD-A103795] N82-13734

PREFOCUSING
Open resonators, formed by confocal mirrors with the variable reflection coefficient and the generalized hyper-spheroidal functions N82-13315

PRELAUNCH SUMMARIES
Mission operation report: INTELSAT V-C(F-3)
[NASA-TM-84072] N82-13162

PREMIXING
Effect of fuel-air-ratio nonuniformity on emissions of nitrogen oxides
[NASA-TP-1798] N82-13143

PRESSURE DISTRIBUTION
Some observations of surface pressures and the near wake of a blunt trailing edge airfoil N82-13100
Pressure distributions on three different cruciform aft-tail control surfaces of a wingless missile at Mach 1.60, 2.36, and 3.70. Volume 1: Trapezoidal tail
[NASA-TM-80097] N82-13110
Unsteady aeroelastic modeling and trailing-edge flap control of an experimental wing in a two dimensional wind tunnel N82-13122

PRESSURE EFFECTS
New ways of looking for phase transitions at multi-megabar dynamic pressures
[DE81-028771] N82-13223
Hydrodynamic computations of pressures generated by steam pipe rupture
[AD-A102046] N82-13449
Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-field
[NASA-TM-82750] N82-13908
Effects of pressure on the mixed valent properties of Ce and its intermetallic compounds
[DE81-028572] N82-13953
Electron band theory and high pressure equation of state
[DE81-027436] N82-13955

PRESSURE GRADIENTS
Crossflow effects on steady and fluctuating pressures on an ogive-cylinder cone-frustum model in supersonic separated flow
[NASA-TP-1951] N82-13108
Application of the method of weighted residuals to the boundary layer momentum and turbulent stress transport equations N82-13374

PRESSURE MEASUREMENTS
Pressure measurements of non-planar stress waves --- dual element strain gage
[DE81-028729] N82-13454

PRESSURE SENSORS
Electronic measurement of airblast overpressure
[AD-A105379] N82-13389

PRESSURE VESSELS
Hydrodynamic computations of pressures generated by steam pipe rupture
[AD-A102046] N82-13449

PROBABILITY DISTRIBUTION FUNCTIONS
Probabilistic error analysis of floating point and CRD arithmetics N82-13758
Assessing probability assessors: Calibration and refinement
[AD-A104174] N82-13815

PROBABILITY THEORY
A stochastic extension of the structural properties of compartment models via a Kronecker algebra N82-13810
Assessing probability assessors: Calibration and refinement
[AD-A104174] N82-13815
An upper asymptote for the three-parameter logistic item-response model
[AD-A103013] N82-13816
Calibration of probabilities: The state of the art to 1980
[AD-A101986] N82-13817

PROBLEM SOLVING
Soviet UCG experience specifically related to field experiments in the United States
[DE81-028642] N82-13244
A method for accelerating convergence to the solution of nonlinear structural equations by reducing residual work N82-13439
Solution of single linear tridiagonal systems and vectorization of the ICOG algorithm on the Cray 1 --- laser fusion
[DE81-025461] N82-13773
A control canonical form for a class of linear hyperbolic systems N82-13786
A nonlinear conservation law with memory --- history boundary value problems in viscoelastic motion
[AD-A103882] N82-13791
The missing boundary problem for smooth manifolds of dimension greater than or equal to six N82-13806
Solution of initial-value problems for some infinite eventually periodic chains of harmonic oscillators N82-13807
An upper asymptote for the three-parameter logistic item-response model
[AD-A103013] N82-13816
On the relationship between analytical regularization and regularization by surgery N82-13823

PROCEEDINGS
Proceedings of the 1981 Army Numerical Analysis and Computers Conference
[AD-A103175] N82-13727

PRODUCTION ENGINEERING
Insoluble anodes for electrowinning zinc and other metals
[PB81-227365] N82-13227
Soviet UCG experience specifically related to field experiments in the United States
[DE81-028642] N82-13244
Further developments in integrated circuit assembling technology
[BMFT-FB-T-80-179] N82-13369
A Module Experimental Process System Development Unit (MEPSDU)
[NASA-CR-165014] N82-13496
Multifunctions - liquid crystal displays
[BMFT-FB-T-80-181] N82-13957

PROFILOMETERS
Acoustical properties of sediments
[AD-A103726] N82-13638

PROGRAM VERIFICATION (COMPUTERS)
Digital Equipment Corporation VAX-11 FORTRAN, version 2
[PB81-232431] N82-13745
Digital Equation Corporation PDP-11 COBOL, version 4.1
[PB81-232423] N82-13746
Sperry Univac ASCII COBOL level 5R2
[PB81-228892] N82-13748
COBOL compiler: Northern Telecom, Inc. NTI COBOL/3
[PB81-226417] N82-13749
A specification and proof technique for message-based systems and its application to distributed database algorithms N82-13756

Study on the implementation of a program for quality control of computer programs, phase 1 --- European Space Agency
[ESA-CR(P)-1444] N82-13780

PROGRAMMING LANGUAGES
Compiler generation from lambda calculus definitions of programming languages N82-13759
Survey of standards applicable to a database management system
[NASA-CR-165009] N82-13766
Problems with the multitasking facilities in the ADA programming language
[AD-A105229] N82-13769
Methods of verification of digital logic N82-13783

PROJECT MANAGEMENT
Line-oriented flight training: Northwest Airlines N82-13125
Natural gas plan needed to provide greater protection for high-priority and critical uses
[PB81-228488] N82-13255

PROJECT PLANNING
Program planner's guide to geothermal development in California
[DE82-000700] N82-13527
LLNL 1981: Technical horizons
[DE81-028265] N82-14048

PROJECTILES
Two-channel telemeter for use in a 3-inch spin air gun
[AD-A102566] N82-13165

PROPAGATION VELOCITY
Two detailed seismic studies in Central California. Part 1: Earthquake clustering and crustal structure studies of the San Andrea fault near San Juan Bautista. Part 2: Seismic velocity structure along the Sierra foothills near Oroville, California N82-13617

PROPELLANT GRAINS
Investigations towards the understanding of surface treatment of propellant grains by means of trace elements
[BMVG-FBWT-79-14] N82-13253

PROPELLANT TESTS
Test number 2 of propellants for rocket motor E573
[FOA-C-20411-D1] N82-13254

PROPELLER FANS
Prop-fan integration at cruise speeds N82-13097

PROPULSION SYSTEM CONFIGURATIONS
The role and implementation of different nacelle/engine simulation concepts for wind-tunnel testing in research and development work on transport aircraft N82-13086
Computational methods for internal flows with emphasis on turbomachinery
[NASA-TM-82764] N82-13113
NASA research in aircraft propulsion
[NASA-TM-82771] N82-13146

PROPULSION SYSTEM PERFORMANCE
The ac propulsion system for an electric vehicle, phase 1
[NASA-CR-165480] N82-13506

PROTECTIVE CLOTHING
Anthropometric sizing systems for Army women's field clothing
[AD-A102104] N82-13724

PROTECTIVE COATINGS
Development of technique for AR coating and nickel and copper metallization of solar cells: FPS project, product development
[NASA-CR-165033] N82-13499
Mitigation of biofouling using coatings
[DE81-027900] N82-13647

PROTON ENERGY
Investigation of photoacoustorefractive effect in LiNbO sub 3 SAW devices
[AD-A103705] N82-13880

PROTON IRRADIATION
Laboratory Research --- spectroscopic analysis, photochemical reactions, and proton irradiation of ice N82-14022

PROTONS
Proton-induced X-ray emission analysis: A complement to analytical methods used in environmental studies
[DE81-029012] N82-13557
Two-satellite study of proton drift on quiet days
[AD-A104736] N82-13601

PROVING
Proving total correctness of nondeterministic programs in infinitary logic
[MC-IW-150/80] N82-13799

PSYCHOLOGICAL FACTORS
Forecasting skill --- weather forecasting
[AD-A099778] N82-13626

PSYCHOMOTOR PERFORMANCE
Results and experience with a small multipurpose tracking simulator N82-13153
Using rewards and penalties to obtain desired subject performance N82-13684
Detecting human operator impairment with a psychomotor task N82-13718

PUBLIC HEALTH
National Research and Development Program: Environmental air. Summary --- air pollution monitoring and modeling; effects on people and their environment N82-13571

PULMONARY CIRCULATION
A monitor for noninvasive estimation of pulmonary blood flow N82-13656

PULSE COMMUNICATION
Synthesis of a plane system of discrete emitters N82-13310
Pulse propagation in dispersive media with applications to plasmas N82-13897

PULSE DURATION
Fiber optic analog and timing monitoring system for the Antares laser fusion program
[DE81-028799] N82-13925

PULSE GENERATORS
Camelot: A novel concept for a multiterawatt pulse power generator for single pulse burst or repetition rate operation
[AD-A103024] N82-13513

PULSE MODULATION
Beam propagation in the frequency-converted subsystems of Nova and Novette
[DE81-028253] N82-13862

PULSE RADAR
Method for measuring brash ice thickness with impulse radar
[AD-A103738] N82-13597

PUMPS
Low-thrust chemical propulsion system pump technology
[NASA-CR-165219] N82-13427

PUPILLOMETRY
Pupillometric measurement of operator workload N82-13666
Physiological assessment of operator workload during manual tracking. 1: Pupillary responses N82-13670
Pupillometry, a bioengineering overview N82-13711

PYLONS
Evaluation of an experimental technique to investigate the effects of the engine position on engine/pylon/wing interference N82-13090
Aerodynamic aspects of a high bypass ratio engine installation on a fuselage afterbody N82-13093

PYROLYSIS
Controlled-flash pyrolysis
[DE82-000284] N82-13196
Synthetic fuel aromaticity and staged combustion
[DE81-024205] N82-13246
Solar-central-receiver fuels and chemicals
[DE82-000941] N82-13530
Pyrolytic characterization of the organic matter in selected coals and in the Devonian shales of southern West Virginia N82-13578

PYROMETERS
New ways of looking for phase transitions at multi-megabar dynamic pressures
[DE81-028771] N82-13223

PYROTECHNICS
Review of low-voltage CP detonators
[DE81-025837] N82-13250

Q

QUALIFICATIONS
Group 4: Instructor training and qualifications N82-13134

QUALITY CONTROL
Study on the implementation of a program for quality control of computer programs, phase 1 --- European Space Agency
[ESA-CR(P)-1444] N82-13780
Fiber optic quality assurance at the Nevada Test Site
[DE81-028740] N82-13890

QUANTITATIVE ANALYSIS
Infiltration and indoor air quality in energy efficient houses in Eugene, Oregon
[DE82-000971] N82-13561

QUANTUM CHROMODYNAMICS
The hadronic decay rate of the Higgs boson: An application of the running mass N82-13842
Spectral functions in quantum chromodynamics and applications N82-13969

QUANTUM MECHANICS
Quantum frames of reference N82-13822
Mechanistic studies of electron exchange kinetics using ab initio
[DE81-026096] N82-13856
A comparative study of classical and quantal approaches to thermal and diffusive transport in a dilute atom-diatom binary mixture N82-13868
Problems in quantum mechanics and gravitation N82-13970

QUANTUM THEORY
Quantum frames of reference N82-13822
Physical adsorption of quantum atomic and molecular systems N82-13846
Long-range interactions in lattice field theory N82-13941
Nuclear slab collision in a relativistic quantum field theory
[DE81-028132] N82-13972

QUARKS
The hadronic decay rate of the Higgs boson: An application of the running mass N82-13842
Pattern of neutrino mixing in grand unified theories
[DE81-029034] N82-13872
Spectral functions in quantum chromodynamics and applications N82-13969

QUASARS
Optical brightness variations in a sample of nineteen radio-quiet quasi-stellar objects N82-14030

R

RADAR IMAGERY
SEASAT equator crossing program
[AD-A099442] N82-13156

RADAR MEASUREMENT
Method for measuring brash ice thickness with impulse radar
[AD-A103738] N82-13597

RADAR TRACKING
Decision aids for airborne intercept operations in advanced aircrafts N82-13683

RADIANCE
DMSP water vapor radiances: A preliminary evaluation
[AD-A099305] N82-13625

RADIANT FLUX DENSITY
Gas turbine combustor soot and radiation N82-13174
Comparison of data inversion techniques for remotely sensed wide-angle observations of Earth emitted radiation
[NASA-TP-1924] N82-13620

RADIANT HEATING
Development of an infrared radiative heating model
[NASA-CR-166272] N82-13622

RADIATION COUNTERS
Three Bureau of Mines optical dust probes
[PB81-231441] N82-13412

RADIATION DAMAGE
Positron lifetime and Doppler broadening techniques applied to irradiation damaged silver
[DE81-028688] N82-13854

RADIATION DOSAGE
Absorbed dose to active red bone marrow from diagnostic and therapeutic uses of radiation
[ARL-TR-021] N82-13651
Specific gamma-ray dose constants for nuclides important to dosimetry and radiological assessment
[DE81-031980] N82-13863

RADIATION EFFECTS
Titanium response to a nuclear radiation environment
[AD-A102516] N82-13220
Effect of solvents on the radiation-induced polymerization of ethyl and isopropyl vinyl ethers
N82-13238

RADIATION HARDENING
Photon-electron correlation in the laboratory testing of electronic components. Part 2: Beam conditioning and diagnostics
[DE81 026606] N82-13365
Effect of gate oxide thickness on the radiation hardness of silicon-gate CMOS
[DE81-027202] N82-13366

RADIATION HAZARDS
Environmental and radiological safety studies: Interaction of (238) PuO2 heat sources with terrestrial and aquatic environments
[DE81-032019] N82-13565

RADIATION MEASUREMENT
Requirements for an effective National Nonionizing Radiation Measurement System
[PB81-223455] N82-13414

RADIATION PRESSURE
Radiatively cooled stellar winds N82-14034

RADIATION SHIELDING
Gamma ray buildup factors in lead-iron and iron-lead shields
[EUR-7086-EN] N82-13864

RADIATION SOURCES
A vacuum ultraviolet radiation source using Cerenkov radiation N82-13894
Saturnian kilometric radiation: Source locations
[NASA-TM-83846] N82-14038

RADIATION SPECTRA
Monte Carlo calculations of channeling radiation
[DE81-027655] N82-13818

RADIATION THERAPY
Absorbed dose to active red bone marrow from diagnostic and therapeutic uses of radiation
[ARL-TR-021] N82-13651

RADIATION TRANSPORT
The transfer of polarized radiation in spectral lines from rotationally distorted stars N82-14031

RADIATIVE HEAT TRANSFER
Radiatively cooled stellar winds N82-14034

RADIATIVE TRANSFER
Microwave attenuation and brightness temperature due to the gaseous atmosphere: A comparison of JPL and CCIR values
[NASA-CR-165027] N82-13300
Development of an infrared radiative heating model
[NASA-CR-166272] N82-13622

RADICALS
Preparation, characterization and performance of non-uniform metal catalysts N82-13204
Laboratory measurements of the cometary photochemical phenomena N82-14023

RADIO ASTRONOMY
Antenna (Selected Articles)
[AD-A106522] N82-13297
Radio astronomical antennas of meter wavelengths N82-13298
Report of survey for McDonald Observatory, Harvard Radio Astronomy Station, and vicinity
[PB81-234338] N82-13606
Radio observations of comets N82-14002
Planetary radio astronomy observations from Voyager-2 near Saturn
[NASA-TM-83856] N82-14037
Saturnian kilometric radiation: Source locations
[NASA-TM-83846] N82-14038

RADIO EQUIPMENT
Standard Bit Error Rate (BER) versus received signal level testing
[AD-A104573] N82-13338

RADIO FREQUENCIES
Conductivity and permittivity measurements of fast ion conductors in the microwave region N82-13351

RADIO FREQUENCY HEATING
Rudimentary theories of the stability of microwave-heated plasmas N82-13910
Brief survey of experimental investigation of instabilities in microwave-heated plasmas
N82-13912

RADIO FREQUENCY IMPEDANCE PROBES
JASPIC-DIP: The digital impedance probe in the JASPIC project
[BMFT-FB-W-80-034] N82-13169
Thin magnetic impedance antennas N82-13314

RADIO FREQUENCY INTERFERENCE
Technical basis for efficient management of geostationary satellite orbit/spectrum N82-13159
Microwave attenuation and brightness temperature due to the gaseous atmosphere: A comparison of JPL and CCIR values
[NASA-CR-165027] N82-13300

RADIO RELAY SYSTEMS
Antenna (selected articles)
[AD-B060598] N82-13307
Two-mirror antenna for radio relay communication
N82-13308
Use of principle of regularization in direct and mixed problems of the theory of the synthesis of radiating systems N82-13309

RADIO SOURCES (ASTRONOMY)
Saturnian kilometric radiation: Source locations
[NASA-TM-83846] N82-14038

RADIO SPECTRA
Spectral efficiency of amplitude companded sideband systems N82-13345

RADIO SPECTROSCOPY
Radio observations of comets N82-14002

RADIO STARS
An investigation of warm carbon stars
N82-14033

RADIO TRANSMISSION
Spectral efficiency of amplitude companded sideband systems N82-13345

RADIO WAVES
Planetary radio astronomy observations from Voyager-2 near Saturn
[NASA-TM-83856] N82-14037

RADIOACTIVE AGE DETERMINATION
Potassium-argon and iodine-xenon gas retention ages of enstatite chondrite meteorites N82-14036

RADIOACTIVE ISOTOPES
Determination of radionuclide species by on-line radiochromatography using high resolution gamma ray spectroscopy N82-13181

RADIOCHEMICAL SEPARATION
Determination of radionuclide species by on-line radiochromatography using high resolution gamma ray spectroscopy N82-13181

RADIOGRAPHY
Energy spectral analysis in projection radiography
N82-13293
Absorbed dose to active red bone marrow from diagnostic and therapeutic uses of radiation
[ARL-TR-021] N82-13651

RADIOLOGY
Specific gamma-ray dose constants for nuclides important to dosimetry and radiological assessment
[DE81-031980] N82-13863

RADON ISOTOPES
Atmospheric 222Rn measurements at San Nicolas Island during 1980
[AD-A104802] N82-13602

RAIL TRANSPORTATION
Environmental impacts of energy transportation
[DE82-900316] N82-13559

RAIN
Millimeter wave alternate route study
[AD-A102303] N82-13339

RAMAN SPECTRA
Study of the physics of insulating films as related to the reliability of metal-oxide semiconductor devices
[AD-A105030] N82-13359
Raman probe of equilibrium and laser modulated populations of electrons and phonons in GaAs
N82-13934

RAMAN SPECTROSCOPY
Surface enhanced Raman spectroscopy for interfacial characterization N82-13175
Theory and calculation of Raman line shapes and excitation profiles near a one photon resonance
N82-13866

RAMPS (STRUCTURES)
Pedestrian movement characteristics on building ramps
[PB81-229163] N82-13988

RANDOM NOISE
Some experimental design techniques in image processing problems N82-13782

RANDOM SAMPLING
Sequential stochastic construction of random polygons N82-13812

RANDOM VARIABLES
Strong convergence of nearest neighbor regression estimators
[AD-A104479] N82-13794

RANDOM VIBRATION
Influence of sine, and random, whole-body vibration on visual acuity
[BMVG-FBWT-79-17] N82-13653
Statistical energy analysis computer program, user's guide
[NASA-CR-161913] N82-13764

RANKINE CYCLE
Manual for the program CASLE: Cycle analysis and second-life evaluation
[DE81-027487] N82-13971

RARE EARTH ELEMENTS
Electrochemical and spectroscopic studies of some less stable oxidation states of selected lanthanide and actinide elements N82-13182

RARE GASES
Coexistence of non-registered monolayer and bilayer solid films N82-13931

REACTION KINETICS
Reduction of nitric oxide in a fluidized bed
[DE81-030488] N82-13198
Investigation into the role of NaCl deposited on oxide and metal substrates in the initiation of hot corrosion
[NASA-CR-165029] N82-13217
Rates and mechanisms of chemical weathering in an organic environment at Panolo Mountain, Georgia
N82-13615

REACTION TIME
Rates and mechanisms of chemical weathering in an organic environment at Panolo Mountain, Georgia
N82-13615
Using rewards and penalties to obtain desired subject performance N82-13684
Load compensating reactions to perturbations at wrist joint in normal man N82-13708

REACTOR CORES
Assessment of the computer code COBRA/CFTL --- for thermal-hydraulic analysis of simulated gas-cooled fast breeder reactor cores
[DE81-027933] N82-13771

REACTOR DESIGN
High-temperature gas-cooled reactor technology development program
[DE81-029096] N82-13871
Effect of Beta limits on reactor performance in EBT N82-13922

REACTOR MATERIALS
Effect of low-temperature irradiation with (n, alpha) helium production on tensile properties of 12 Cr-1 Mo VW-type steels
[DE81-028578] N82-13222

REACTOR PHYSICS
High-temperature gas-cooled reactor technology development program
[DE81-029096] N82-13871

READOUT
Two-channel telemeter for use in a 3-inch spin air gun
[AD-A102566] N82-13165

REAL TIME OPERATION
Group 1: Scenario design and development issues N82-13131
Group 2: Real time LOFT operations N82-13132
A real time Pegasus propulsion system model for VSTOL piloted simulation evaluation
[NASA-TM-82770] N82-13144
Simple geometric algorithms to aid in clearance management for robotic mechanisms N82-13680
Decision aids for airborne intercept operations in advanced aircrafts N82-13683
Problems with the multitasking facilities in the ADA programming language
[AD-A105229] N82-13769

RECOMBINATION REACTIONS
Measurement of surface recombination velocity for silicon solar cells using a scanning electron microscope with pulsed beam
[JPL-PUB-81-64] N82-13494

RECTANGULAR WINGS
Investigation of the vortex field generated by an airfoil model in a wind tunnel, using ultrasonic pulses
[MPIS-MITT-69] N82-13118

RECURSIVE FUNCTIONS
Some experimental design techniques in image processing problems N82-13782
RECYCLING
Construction of a recycled Portland cement concrete pavement --- Connecticut expressway [PB81-233553] N82-13267
Benefication with magnetic fluids [PB81-227126] N82-13485
REEFS
Artificial Reefs: Proceedings of a Conference [PB81-227779] N82-13644
REENTRY SHIELDING
Air Force technical objective document FY 1982 [AD-A099741] N82-13982
REFINING
Feasibility study report for the Imperial Valley Ethanol Refinery: A 14.9-million-gallon-per-year ethanol synfuel refinery utilizing geothermal energy [DE82-000288] N82-13252
REFLECTANCE
Spectrophotometry of faint comets: The asteroid approach N82-13998
REFLECTED WAVES
Open resonators, formed by confocal mirrors with the variable reflection coefficient and the generalized hyper-spheroidal functions N82-13315
Laboratory study of sound propagation into a fast bottom medium [AD-A104596] N82-13831
REFLECTOMETERS
Mathematical model of differential reflectometry for use in the investigation of thin film corrosion products N82-13232
Fiber optic time domain reflectometers: Approaches to performance improvement N82-13893
REFLEXES
Model simulation studies to clarify the effect on saccadic eye movements of initial condition velocities set by the Vestibular Ocular Reflex (VOR) N82-13712
REFRACTIVITY
Inverse cerenkov interaction between relativistic electrons and laser light N82-13425
Critically evaluated data on optical and transport properties of solids (refractive index and absorption coefficient of selected optical materials) [AD-A105059] N82-13879
Investigation of photoacoustorefractive effect in LiNbO sub 3 SAW devices [AD-A103705] N82-13880
REFRIGERATING
Design and development of a reciprocating low-temperature freon expander [DE81-028609] N82-13392
REFRIGERATING MACHINERY
Design and development of a reciprocating low-temperature freon expander [DE81-028609] N82-13392
REFRIGERATORS
Appliance efficiency and the solar building [DE81-029073] N82-13265
REGRESSION ANALYSIS
Analysis of soil moisture extraction algorithm using data from aircraft experiments [NASA-CR-166719] N82-13470
New optimization research [AD-A104864] N82-13793
Strong convergence of nearest neighbor regression estimators [AD-A104479] N82-13794
REINFORCED PLATES
An experimental study of a reinforced concrete folded plate structure with edge beams N82-13443
REINFORCEMENT (STRUCTURES)
Optimum Design of Static, Earthquake, and Wind Steel Structures (ODSEWS-2D) [PB81-232738] N82-13271
An experimental study of a reinforced concrete folded plate structure with edge beams N82-13443
RELATIVISTIC EFFECTS
A relativistic magnetron with a thermionic cathode N82-13353
Nuclear slab collision in a relativistic quantum field theory [DE81-028132] N82-13972
RELATIVISTIC ELECTRON BEAMS
Inverse cerenkov interaction between relativistic electrons and laser light N82-13425
A vacuum ultraviolet radiation source using Cerenkov radiation N82-13894
RELATIVISTIC PARTICLES
Monte Carlo calculations of channeling radiation [DE81-027655] N82-13818
RELATIVISTIC THEORY
Quantum frames of reference N82-13822
RELIABILITY
Future directions in Navy electronic system reliability and survivability [AD-A102460] N82-13438
RELIABILITY ANALYSIS
Fiber optics (optical waveguides) technology: Potential application in the DCS [AD-A104740] N82-13303
Confidence intervals for the reliability of a future system configuration [AD-A105031] N82-13814
Statistical analysis of accelerated temperature aging of semiconductor devices [AD-A099439] N82-13946
RELIABILITY ENGINEERING
Distributed photovoltaic systems: Utility interface issues and their present status [NASA-CR-165019] N82-13492
REMOTE CONTROL
Video framerate, resolution and grayscale tradeoffs for undersea telemanipulator N82-13673
Man/machine interface development for the REMOTEX concept N82-13678
Identification of cognitive factors related to remote work performance using closed circuit TV displays N82-13679
REMOTE HANDLING
Research issues in implementing remote presence in teleoperator control N82-13676
Man/machine interface development for the REMOTEX concept N82-13678
Identification of cognitive factors related to remote work performance using closed circuit TV displays N82-13679
Multi-axis manual controllers: A state-of-the-art report N82-13701
Design and development of a six degree of freedom hand controller N82-13706
REMOTE SENSING
Laboratory measurements of physical, chemical, and optical characteristics of Lake Chicot sediment waters [NASA-TP-1941] N82-13468
Interpolating for the location of remote sensor data [NASA-TM-82169] N82-13469
SAM 2 measurements of the polar stratospheric aerosol, volume 1: October to April 1979 [NASA-RP-1081] N82-13592
DMSP water vapor radiances: A preliminary evaluation [AD-A099305] N82-13625
REPEATERS
Investigation of modulation methods and system aspects for regenerative satellite-repeater [BMFT-FB-W-80-024] N82-13342
REPRODUCTION (COPYING)
Imaging systems for fast electrophotographic processes [BMFT-FB-T-80-183] N82-13411
REQUIREMENTS
Requirements for an effective National Nonionizing Radiation Measurement System [PB81-223455] N82-13414
RESEARCH
A summary of the Naval Postgraduate School Research Program [AD-A104112] N82-13975
Report on research and technology-FY 1981 [NASA-TM-81367] N82-14047
RESEARCH AND DEVELOPMENT
LLNL 1981: Technical horizons [DE81-028265] N82-14048
RESEARCH FACILITIES
Fiber optic quality assurance at the Nevada Test Site [DE81-028740] N82-13890
RESEARCH MANAGEMENT
The International Halley Watch: A program of coordination, cooperation and advocacy N82-14026
RESIDENTIAL ENERGY
Ultimate in building energy analysis: DOE-2 and BLAST [DE81-028703] N82-13263
Appliance efficiency and the solar building [DE81-029073] N82-13265
Annual cycle energy system experimental performance and national applicability [DE81-028570] N82-13523
Data report for the northeast residential experiment station, June 1981 --- photovoltaic systems [DE82-000068] N82-13533
Experimental and analytical systems studies of a combined thermal-photovoltaic residential solar system [DE81-029539] N82-13534
Infiltration and indoor air quality in energy efficient houses in Eugene, Oregon [DE82-000971] N82-13561
High altitude testing of residential wood-fired combustion equipment [PB81-226151] N82-13575
RESIDUAL GAS
Dynamic mass spectrometry: A residual gas analysis method and some applications [DE81-026230] N82-13195
RESIDUAL STRESS
Behavior of plane panels in ship structures with local initial deflections [BMVG-FBWT-80-18] N82-13455
Residual stress and deformation in circumferential pipe-joint welds [PB81-232464] N82-13458
RESIN MATRIX COMPOSITES
Effects of hygrothermal conditioning on the dynamic behavior of resin matrix composites N82-13172
RESISTORS
Two-dimensional effects in power take-off region [DE82-000091] N82-13367
RESOLUTION
Optical scanner system for internal inspection of steam-generator tubes [EPRI-NP-1944] N82-13884
RESONANCE FLUORESCENCE
Composition dependance of neodymium optical homogeneous linewidths in glasses N82-13945
RESONANT FREQUENCIES
Study of corrugated plates N82-13426
Structural dynamics: Modified calculations --- natural and harmonically excited vibrations of modified structures; increased computation efficiency [BMVG-FBWT-81-1] N82-13457
RESONATORS
Excitation of radial resonator with annular slot N82-13328
RESOURCE ALLOCATION
Natural gas plan needed to provide greater protection for high-priority and critical uses [PB81-228488] N82-13255
RESOURCES MANAGEMENT
Development of peatlands in northern Minnesota [DE82-000873] N82-13475
Managing information technology change in the decade of the 80's [AD-A099441] N82-13976
RESPIRATORY SYSTEM
Deposition of aerosol particles in the human respiratory tract N82-13659
RESPONSE BIAS
Modeling human tracking error in several different anti-tank systems N82-13699
RETORT PROCESSING
Design and test of two-step solar oil shale retort [DE82-000964] N82-13543
REUSABLE SPACECRAFT
Concept and feasibility study (phase A) for the X-ray satellite ROBISAT. Executive summary [BMFT-FB-W-80-027] N82-13164
REVERSE FIELD PINCH
The reverse-field rigid rotor model, calculation and simulation N82-13898
REVERSE OSMOSIS
Treatment of biomass gasification wastewaters using reverse osmosis [DE82-000698] N82-13566
REYNOLDS NUMBER
A review of the effect of Reynolds number on afterbody drag N82-13080

Studies of air inlets at Reynolds numbers comparable to flight in ONERA's F1 and S1MA wind tunnels N82-13091
An experimental investigation of the flow past a finite circular cylinder at a low subcritical Reynolds number N82-13105
Force and moment, flow-visualization, and boundary-layer tests on a shuttle orbiter model at Mach 6
[NASA-TP-1952] N82-13106
Energetics and dynamics of droplet evaporation in high temperature intermediate Reynolds number flows N82-13379

RHEOLOGY
A study of the dynamic and transient properties of polymer solutions N82-13241
H-Coal product physical properties measurement
[DE81-029095] N82-13245

RHYTHM (BIOLOGY)
A systems analysis of the maturation of sleep using a semi-Markov model N82-13658

RIGID ROTORS
System identification helicopter parameters. Determination from flight tests, phase 2
[BMVG-FBWT-80-12] N82-13137

RIGID STRUCTURES
User's manuals for DYNA3D and DYNAP: Nonlinear dynamic analysis of solids in three dimensions
[DE81-028360] N82-13772

RING LASERS
Investigation of fluctuation phenomena in dye lasers N82-13419

RINGS (MATHEMATICS)
The existence of nonzero maps from injectives to projectives N82-13808

ROBOTS
Dynamic analysis of flexible spatial mechanisms and robotic manipulators N82-13460

ROBUSTNESS (MATHEMATICS)
A contribution to robust detection and estimation N82-13809

ROCKET EXHAUST
Consolidation of data base for Army generalized missile model
[NASA-CR-166273] N82-13046

ROCKET FLIGHT
A preliminary analysis of the data from experiment 77-13 and final report on glass fining experiments in zero gravity
[NASA-CR-161884] N82-13154

ROCKET-BORNE INSTRUMENTS
Temperature and density of geocoronal helium derived from a rocket-borne He resonance cell experiment
[BMFT-FB-W-80-015] N82-13605

RODS
Nonlinear waves in rods
[AD-A101333] N82-13447

ROOM TEMPERATURE
Electric coheating experiment to determine the heat-loss coefficient of a double-envelope house
[DE81-027937] N82-13264

ROOT-MEAN-SQUARE ERRORS
A synthesis method for estimating maximum instantaneous inlet distortion based on measured inlet steady state and RMS pressures N82-13083

ROTARY WINGS
Wind-tunnel investigation of the effects of blade tip geometry on the interaction of torsional loads and performance for an articulated helicopter rotor
[NASA-TP-1926] N82-13107

ROTATING BODIES
The transfer of polarized radiation in spectral lines from rotationally distorted stars N82-14031

ROTOR AERODYNAMICS
Wind-tunnel investigation of the effects of blade tip geometry on the interaction of torsional loads and performance for an articulated helicopter rotor
[NASA-TP-1926] N82-13107
An aerodynamic design and the overall stage performance of an air-cooled axial-flow turbine
[NAL-TR-321T] N82-13109

ROTOR BLADES (TURBOMACHINERY)
Thrust modulation methods for a subsonic V/STOL aircraft
[NASA-TM-82747] N82-13112
Computational methods for internal flows with emphasis on turbomachinery
[NASA-TM-82764] N82-13113

ROTORS
Development of advanced rotor-bearing systems for feedwater pumps, phase 2
[DE82-900376] N82-13431

RUDDERS
Limited evaluation of an F-14A airplane utilizing an aileron-rudder interconnect control system in the landing configuration
[NASA-TM-81972] N82-13148

RUNNING
A digital TV system for the detection of high speed human motion N82-13289

RUNWAYS
Measured pavement response to transient aircraft loadings N82-13442

RUPTURING
Hydrodynamic computations of pressures generated by steam pipe rupture
[AD-A102046] N82-13449

S

S MATRIX THEORY
Ultraviolet structure of supersymmetric non-linear sigma-models N82-13843

S WAVES
Large amplitude compression and shear wave propagation in impact-loaded PMMA
[AD-A105953] N82-13450

S-N DIAGRAMS
An investigation of notch low cycle fatigue life behavior of Rene' 80 at high temperature N82-13214

SABOT PROJECTILES
Transitional ballistics of hypervelocity projectiles
[BMVG-FBWT-80-1] N82-13163

SACCADIC EYE MOVEMENTS
Pilot scanning patterns while viewing cockpit displays of traffic information N82-13710
Model simulation studies to clarify the effect on saccadic eye movements of initial condition velocities set by the Vestibular Ocular Reflex (VOR) N82-13712

SADDLE POINTS
Zeros of successive derivatives of some entire functions of infinite order N82-13788

SAFETY DEVICES
Practical aspects of instrumentation system installation, volume 13
[NASA-TM-84067] N82-13140

SAFETY MANAGEMENT
Review of fire test methods and incident data for portable electric cables in underground coal mines
[PB81-227878] N82-13272
Control of methane by ventilation of shafts during raise drilling
[PB81-234502] N82-13487

SAGE SATELLITE
SAM 2 measurements of the polar stratospheric aerosol, volume 1: October to April 1979
[NASA-RP-1081] N82-13592

SALINITY
The chemistry of saline water chlorination N82-13178
ICAPS oceanographic data for the Indian Ocean
[AD-A103173] N82-13641

SAMPLING
Studies of sample introduction for inductively coupled plasma emission spectrometry N82-13209

SAN ANDREAS FAULT
Two detailed seismic studies in Central California. Part 1: Earthquake clustering and crustal structure studies of the San Andrea fault near San Juan Bautista. Part 2: Seismic velocity structure along the Sierra foothills near Oroville, California N82-13617

SAN JOAQUIN VALLEY (CA)
The occurrence and control of land subsidence due to ground water withdrawal with special reference to the San Joaquin and Santa Clara Valleys, California N82-13466

SANDS
Effective stress-strain-strength behavior of silicate-grouted sand N82-13257
A laboratory evaluation of modified asphalt
[PB81-231615] N82-13269
Injection and distribution of silicate grout in sand N82-13287
Laboratory study of sound propagation into a fast bottom medium
[AD-A104596] N82-13831

SATELLITE ATTITUDE CONTROL
Satellite attitude control with decomposed controller
[LOG-G668] N82-13160

SATELLITE CONFIGURATIONS
Mission operation report: INTELSAT V-C(F-3)
[NASA-TM-84072] N82-13162
Concept and feasibility study (phase A) for the X-ray satellite ROBISAT. Executive summary
[BMFT-FB-W-80-027] N82-13164

SATELLITE NETWORKS
Effects of the Satellite Power System on low Earth orbit and geosynchronous satellites
[PB81-232019] N82-13157

SATELLITE OBSERVATION
Correlated ground-based and the observations N82-14008

SATELLITE ORBITS
SEASAT equator crossing program
[AD-A099442] N82-13156

SATELLITE POWER TRANSMISSION (TO EARTH)
Effects of the Satellite Power System on low Earth orbit and geosynchronous satellites
[PB81-232019] N82-13157

SATELLITE SOLAR ENERGY CONVERSION
Silicon solar cell optimization
[AD-A106005] N82-13514

SATELLITE-BORNE PHOTOGRAPHY
Scanner --- photography from a spin stabilized synchronous satellite
[NASA-CASE-GSC-12032-2] N82-13465

SATURN (PLANET)
Planetary radio astronomy observations from Voyager-2 near Saturn
[NASA-TM-83856] N82-14037
Saturnian kilometric radiation: Source locations
[NASA-TM-83846] N82-14038

SCALARS
Mixing of a passive scalar in isotropic and sheared homogeneous turbulence N82-13405
A control canonical form for a class of linear hyperbolic systems N82-13786

SCALE (RATIO)
Impacts of vertical scale distortion on turbulent mixing in hydraulic models N82-13382

SCALE MODELS
Impacts of vertical scale distortion on turbulent mixing in hydraulic models N82-13382
Theory and application of experimental model analysis in earthquake engineering N82-13588

SCALING LAWS
Two-D results on human operator perception N82-13697

SCANNERS
Scanner --- photography from a spin stabilized synchronous satellite
[NASA-CASE-GSC-12032-2] N82-13465

SCANNING
Pilot scanning patterns while viewing cockpit displays of traffic information N82-13710

SCATTERING CROSS SECTIONS
Double differential continuum neutron scattering cross sections in iron and nickel for incident energies of 7.5, 10 and 12 MeV N82-13847
Compton scattering in a uniform, constant magnetic field N82-13968

SCENE ANALYSIS
Computer vision
[NASA-CR-165012] N82-13768

SCHEDULING
Preemptive scheduling of a multiprocessor system with memories to minimize L sub max
[AD-A103795] N82-13734
Parallel scheduling algorithms
[AD-A103796] N82-13820

SCHMIDT CAMERAS
The JOCR program --- Joint Observatory for Cometary research N82-14013

SCINTILLATION
Ionospheric scintillation N82-13585
High latitude measurements of the Total Electron Content (TEC) using the Faraday technique and comparisons with TEC estimates from NAVSTAR-GPS data
[AD-A103042] N82-13603

SEA ICE
Compensation for use of monthly-averaged winds in numerical modeling
[NASA-TM-83855] N82-13623

SEA ROUGHNESS
Surface signs of internal ocean dynamics
[AD-A101380] N82-13642

SEA STATES
Biological and physical oceanographic observations pertaining to the trawl fishery in a region of persistent coastal upwelling
[NASA-TM-81332] N82-13637

SEA WATER
The chemistry of saline water chlorination N82-13178
Solubilities of dissolved gases in sea water
[AD-A100675] N82-13189
Salt removal from brackish water by continuous processes with amphoteric, thermally regenerable ion-exchange resins N82-13202
Response of the oceans to increasing atmospheric carbon dioxide
[DE81-028178] N82-13558
Mixed layer depth distributions from SVSTD data
[AD-A105669] N82-13834

SEALS (STOPPERS)
Thermoelastic instability in a seal-like configuration N82-13436

SEAMOUNTS
Acoustic boundary wave generation and shadowing at a seamount
[AD-A104594] N82-13832

SEARCH PROFILES
Query optimization by semantic reasoning N82-13762

SEASAT PROGRAM
SEASAT equator crossing program
[AD-A099442] N82-13156

SEDIMENTS
Energy generation and the sulfur-carbon cycle
[DE81-030949] N82-13562
The trace metal stratigraphy and recent sedimentary history of anthrogenous particulates on the San Pedro Shelf, California N82-13579
Acoustical properties of sediments
[AD-A103726] N82-13638

SEISMIC WAVES
The crustal structure of Kilauea and Mauna Loa volcanoes, Hawaii, from seismic refraction and gravity data N82-13583
Surface waves in strong ground motion with application to offshore environments N82-13584
Two detailed seismic studies in Central California. Part 1: Earthquake clustering and crustal structure studies of the San Andrea fault near San Juan Bautista. Part 2: Seismic velocity structure along the Sierra foothills near Oroville, California N82-13617

SEISMOLOGY
Surface waves in strong ground motion with application to offshore environments N82-13584
International seismological data center. Input data for an experimental data base
[FOA-C-20380-T1] N82-13604

SELECTIVE DISSEMINATION OF INFORMATION
Information resources in the USA on new and renewable energy, a description and directory
[DE81-028867] N82-13522

SELF STIMULATION
Multiple man-machine interfaces N82-13682

SEMANTICS
Compiler generation from lambda calculus definitions of programming languages N82-13759
Query optimization by semantic reasoning N82-13762
Preliminary analysis of a breadth-first parsing algorithm: Theoretical and experimental results
[AD-A101852] N82-13797

SEMICONDUCTING FILMS
Study of the physics of insulating films as related to the reliability of metal-oxide semiconductor devices
[AD-A105030] N82-13359
Transport noise arising from diffusion and bulk or surface generation recombination in semiconductors N82-13963
The growth and carrier transport properties of sputter deposited GaAs thin films doped with silicon and magnesium N82-13965

SEMICONDUCTOR DEVICES
Direct digital simulation of power semiconductor-controlled electrical machines N82-13355
Techniques for energy conservation in ac motor-driven systems
[DE82-900356] N82-13537
Statistical analysis of accelerated temperature aging of semiconductor devices
[AD-A099439] N82-13946

SEMICONDUCTOR JUNCTIONS
Development of high-efficiency cascade solar cells
[DE81-029633] N82-13540

SEMICONDUCTORS (MATERIALS)
Flat-plate solar array project: Experimental process system development unit for producing semiconductor-grade silicon using the silane-to-silicon process
[NASA-CR-165022] N82-13498
CW laser annealing and CW laser assisted diffusion in gallium arsenide N82-13943

SENSORY FEEDBACK
The persistence of a visual dominance effect in a telemanipulator task: A comparison between visual and electrotactile feedback N82-13677

SENTENCES
Preliminary analysis of a breadth-first parsing algorithm: Theoretical and experimental results
[AD-A101852] N82-13797

SEPARATED FLOW
Crossflow effects on steady and fluctuating pressures on an ogive-cylinder cone-frustum model in supersonic separated flow
[NASA-TP-1951] N82-13108

SEQUENTIAL ANALYSIS
Sequential stochastic construction of random polygons N82-13912

SERIES (MATHEMATICS)
On general 1 exp p summability methods
[CTH-MATH-1981-07] N82-13803

SERVICE LIFE
Long-term operation of a sealed waveguide CO sub 2 laser
[AD-A105261] N82-13420

SERVOMECHANISMS
Fatigue test machines N82-13277
Variable amplitude fatigue testing N82-13278
Man/machine interface development for the REMOTEX concept N82-13678

SET THEORY
The least fixed point property for omega chain continuous functions N82-13787
Zeros of successive derivatives of some entire functions of infinite order N82-13788
On the dependence of the growth of an entire function of the distribution of the zeros of its derivatives and a conjecture of G. Polya N82-13805

SEWAGE
The trace metal stratigraphy and recent sedimentary history of anthrogenous particulates on the San Pedro Shelf, California N82-13579

SEWAGE TREATMENT
Nitrogen and phosphorus reactions in overland flow of wastewater
[PB81-239311] N82-13574

SEX FACTOR
Determination of efficient methods of lift by comparing trained and untrained male and female lifters
[AD-A100349] N82-13650

SHADES
Minimum/constant voltage PLZT electrooptic shutters --- lead lanthanum zirconate titanate wafers for flash protective goggles
[DE81-028646] N82-13588

SHAFTS (MACHINE ELEMENTS)
Analysis of multicylinder IC-Engine crankshafts with hydrodynamic bearings using a finite element-transfer matrix approach N82-13437

SHALE OIL
Solar-central-receiver fuels and chemicals
[DE82-000941] N82-13530
Design and test of two-step solar oil shale retort
[DE82-000964] N82-13543

SHALES
Pyrolytic characterization of the organic matter in selected coals and in the Devonian shales of southern West Virginia N82-13578

SHALLOW SHELLS
An integral equation method for cutout problems in shells N82-13459

SHAPE CONTROL
Shape determination and control for large space structures
[JPL-PUB-81-71] N82-13166

SHEAR STRAIN
Strain-induced crystallization of polymers N82-13239

SHEAR STRESS
Influence of wall roughness, adverse pressure gradient and heat transfer on wall shear stress measurements with Preston tubes
[ILR-50] N82-13396

SHELLS (STRUCTURAL FORMS)
Electric coheating experiment to determine the heat-loss coefficient of a double-envelope house
[DE81-027937] N82-13264
An integral equation method for cutout problems in shells N82-13459

SHIELDING
Some RAE research on shielded and unshielded fuselage mounted air intakes at subsonic and supersonic speeds N82-13068

SHIPS
Behavior of plane panels in ship structures with local initial deflections
[BMVG-FBWT-80-18] N82-13455
The influence of ship motion of manual control skills N82-13703

SHOCK FRONTS
Role of molecular dynamics on descriptions of shock front processes
[DE81-028687] N82-13857

SHOCK LOADS
Role of molecular dynamics on descriptions of shock front processes
[DE81-028687] N82-13857

SHOCK TUBES
On a dusty-gas shock tube
[UTIAS-250] N82-13151

SHOCK WAVE GENERATORS
On a dusty-gas shock tube
[UTIAS-250] N82-13151

SHOCK WAVE INTERACTION
Rayleigh-Taylor stability for a shock wave-density discontinuity interaction
[DE81-028707] N82-13394

SHOCK WAVE PROFILES
Rayleigh-Taylor stability for a shock wave-density discontinuity interaction
[DE81-028707] N82-13394

SHOCK WAVES
Properties of matter at ultra-high pressures
[DE81-026504] N82-13190
New ways of looking for phase transitions at multi-megabar dynamic pressures
[DE81-028771] N82-13223
Rayleigh-Taylor stability for a shock wave-density discontinuity interaction
[DE81-028707] N82-13394
Formulas for one-dimensional local properties for molecular-dynamics simulations of shock waves
[DE82-000906] N82-13395
Impedance-match experiments using high intensity lasers
[DE81-025802] N82-13422
Impedance-matching experiments using high-pressure, laser-driven shock waves
[DE81-028732] N82-13423

SHORELINES
Surface waves in strong ground motion with application to offshore environments N82-13584

SHORT TAKEOFF AIRCRAFT
Integration of advanced exhaust nozzles N82-13075

SHORT WAVE RADIO TRANSMISSION
Three-stage commutation field of the system of the repeated use of short-wave receiving antennas N82-13317

SHROUDED NOZZLES
The subsonic performance of practical military variable area convergent nozzles N82-13076
High-pressure shrouded water sprays for dust control
[PB81-231458] N82-13483

SIDEBANDS
Theoretical analysis of the effects of turbulence on a mobile parametric receiver
[AD-A101418] N82-13833
SIERRA NEVADA MOUNTAINS (CA)
The Sierra Cooperative Pilot Project: Precipitation management research in the Sierra Nevada
[PB81-234452] N82-13630
SIGMA-MESONS
Ultraviolet structure of supersymmetric non-linear sigma-models N82-13843
SIGNAL DETECTION
Estimation of variable latency signals via unwrapped phase averaging with application to visual evoked potentials N82-13347
Error bounds for reconstruction of a function f from a finite sequence (SGN(ft sub i) + x sub i))
[AD-A104477] N82-13795
SIGNAL DISTORTION
Detection of infrasound generated by Clear Air Turbulence (CAT) N82-13830
SIGNAL ENCODING
Trellis data compression N82-13784
SIGNAL FADING
Two-path model of fading in a high data rate communication channel N82-13292
SIGNAL MEASUREMENT
Three laser experiments in gases N82-13416
SIGNAL PROCESSING
Topics in digital signal processing N82-13346
FOA 27 control instruments data system. Control instruments and their functions
[FOA-C-20394-D3] N82-13410
Digital data compression algorithm performance comparisions: Proposed NATO standard algorithm provides better facsimile in a noisy communications environment than present Tactical Digital Facsimile algorithm
[AD-A103159] N82-13737
Fiber optic time domain reflectometers: Approaches to performance improvement N82-13893
SIGNAL RECEPTION
Principles of the construction of systems, which possess potential frequency independence --- antenna design N82-13330
SIGNAL TO NOISE RATIOS
Standard Bit Error Rate (BER) versus received signal level testing
[AD-A104573] N82-13338
Short-range communications using diffusely scattered infrared radiation N82-13344
Estimation of variable latency signals via unwrapped phase averaging with application to visual evoked potentials N82-13347
SILANES
Flat-plate solar array project: Experimental process system development unit for producing semiconductor-grade silicon using the silane-to-silicon process
[NASA-CR-165022] N82-13498
SILICATES
Constitution of silicate anions in tetraethyl-ammonium silicates and their aqueous solutions
[NRC/CNR-TT-2004] N82-13170
Effective stress-strain-strength behavior of silicate-grouted sand N82-13257
Injection and distribution of silicate grout in sand N82-13287
SILICON
Energy levels in and on an oxide film as measured by electrochemical methods
[AD-A103704] N82-13187
Measurement of surface recombination velocity for silicon solar cells using a scanning electron microscope with pulsed beam
[JPL-PUB-81-64] N82-13494
A Module Experimental Process System Development Unit (MEPSDU)
[NASA-CR-165014] N82-13496
Large area sheet task: Advanced dendritic web growth development
[NASA-CR-165013] N82-13497
Flat-plate solar array project: Experimental process system development unit for producing semiconductor-grade silicon using the silane-to-silicon process
[NASA-CR-165022] N82-13498
Continuous Czochralski growth: Silicon sheet growth development of the large area sheet task of the low cost silicon solar array project
[NASA-CR-165030] N82-13500
Monte Carlo calculations of channeling radiation
[DE81-027655] N82-13818
Critically evaluated data on optical and transport properties of solids (refractive index and absorption coefficient of selected optical materials)
[AD-A105059] N82-13879
Current transient spectroscopy of deep levels in silicon N82-13929
Upper critical fields and span states in A-15 superconductors, part 1. Vortices in two-dimensional superconductors, part 2 N82-13942
CW laser annealing and CW laser assisted diffusion in gallium arsenide N82-13943
Electron beam evaporation of superconducting, A15 niobium-silicon N82-13944
SILICON DIOXIDE
Energy levels in and on an oxide film as measured by electrochemical methods
[AD-A103704] N82-13187
Advanced indium antimonide monolithic charge coupled infrared imaging arrays
[NASA-CR-165799] N82-13356
Energy losses and mean free paths of electrons in silicon dioxide
[DE81-026353] N82-13860
SILICON FILMS
Preparation and characterization of hydrogenated amorphous silicon
[DE81-030973] N82-13197
The physical and electrical properties of polycrystalline-silicon N82-13964
SILICON NITRIDES
Development of technique for AR coating and nickel and copper metallization of solar cells: FPS project, product development
[NASA-CR-165033] N82-13499
SILVER
Surface enhanced Raman spectroscopy for interfacial characterization N82-13175
Insoluble anodes for electrowinning zinc and other metals
[PB81-227365] N82-13227
A study of the surface reactivity of silver: An acid base characterization of oxidation reactions N82-13233
Positron lifetime and Doppler broadening techniques applied to irradiation damaged silver
[DE81-028688] N82-13854
SIMULATION
Wind tunnel tests of powered models: A comparison of two methods of simulating the jets of jet engines N82-13087
Two-channel telemeter for use in a 3-inch spin air gun
[AD-A102566] N82-13165
Photon-electron correlation in the laboratory testing of electronic components. Part 2: Beam conditioning and diagnostics
[DE81-026606] N82-13365
SIMULATORS
A device for simulating at a compressor bench an air inlet with large incidence N82-13081
Proceedings of the Seventeenth Annual Conference on Manual Control
[NASA-CR-165005] N82-13665
SINE WAVES
Influence of sine, and random, whole-body vibration on visual acuity
[BMVG-FBWT-79-17] N82-13653
SINGLE CRYSTALS
Deformation-enhanced photoemission from metals N82-13231
Continuous Czochralski growth: Silicon sheet growth development of the large area sheet task of the low cost silicon solar array project
[NASA-CR-165030] N82-13500
Boron implanted strontium titanate N82-13939
HgCdTe fabrication using directed energy techniques
[AD-A105626] N82-13947
Push-pull fatigue of LiF and MgO single crystals N82-13960
SINGULARITY (MATHEMATICS)
Curvature singularities in certain space-times N82-13824
SITE SELECTION
Residual-energy-applications program environmental analysis report --- industrial scale waste heat recovery equipment and utilization
[DE81-027538] N82-13525
Application of Bayesian analysis for wind energy site evaluation N82-13619
SKIN FRICTION
Influence of wall roughness, adverse pressure gradient and heat transfer on wall shear stress measurements with Preston tubes
[ILR-50] N82-13396
SLABS
Computer program for optimum nonlinear dynamic design of reinforced concrete slabs under blast loading (CBARCS)
[AD-A104253] N82-13262
Nuclear slab collision in a relativistic quantum field theory
[DE81-028132] N82-13972
SLAGS
Electrical effects of slag in a diffuse mode magnetohydrodynamic generator N82-13550
SLEEP
A systems analysis of the maturation of sleep using a semi-Markov model N82-13658
SLENDER BODIES
A calculation method for slender wing-body configurations in supersonic flow at high angles of attack --- nonlinear force and pitching moment characteristics
[BMVG-FBWT-79-15] N82-13115
SLENDER WINGS
An approximate analytical method for vortex-lift and center of pressure on the slender wing
[NASA-TM-83198] N82-13045
A calculation method for slender wing-body configurations in supersonic flow at high angles of attack --- nonlinear force and pitching moment characteristics
[BMVG-FBWT-79-15] N82-13115
SLIDING FRICTION
Thermoelastic instability in a seal-like configuration N82-13436
A continuum model for friction with applications in metal forming plasticity N82-13445
SLOT ANTENNAS
Excitation of radial resonator with annular slot N82-13328
Natural and mutual conductivities of half-wave slots, arbitrarily oriented on the conducting surface of circular cylinder --- slot antennas N82-13331
SLURRIES
H-Coal product physical properties measurement
[DE81-029095] N82-13245
SOCIAL FACTORS
The evaluation of technology R&D: A continuing Dilemma
[RAND/P-6655] N82-13980
SODIUM
High-temperature measurements of alkali levels in an experimental 6-inch AFBC
[DE81-023632] N82-13193
Molecular dynamics calculations for sodium using pseudopotential theory
[DE81-029022] N82-13853
SODIUM CHLORIDES
An improved stress corrosion test medium for aluminum alloys
[NASA-TM-82452] N82-13216
Investigation into the role of NaCl deposited on oxide and metal substrates in the initiation of hot corrosion
[NASA-CR-165029] N82-13217
SOFTENING
The effects of added softening agents upon the behavior of cold recycled asphalt mixtures
[PB81-231417] N82-13268
SOIL MECHANICS
Injection and distribution of silicate grout in sand N82-13287
SOIL MOISTURE
Analysis of soil moisture extraction algorithm using data from aircraft experiments
[NASA-CR-166719] N82-13470
SOLAR ARRAYS
Space applicable DOE photovoltaic technology: An update
[NASA-CR-165021] N82-13491

Large area sheet task: Advanced dendritic web growth development
[NASA-CR-165013] N82-13497

Flat-plate solar array project: Experimental process system development unit for producing semiconductor-grade silicon using the silane-to-silicon process
[NASA-CR-165022] N82-13498

Continuous Czochralski growth: Silicon sheet growth development of the large area sheet task of the low cost silicon solar array project
[NASA-CR-165030] N82-13500

Design, fabrication, test, qualification, and price analysis of third generation design solar cell modules
[NASA-CR-165007] N82-13502

Inexpensive thermographic techniques for determining reliable solar-collector-array performance
[DE82-001151] N82-13528

Data report for the northeast residential experiment station, June 1981 --- photovoltaic systems
[DE82-000068] N82-13533

SOLAR CELLS

Distributed photovoltaic systems: Utility interface issues and their present status
[NASA-CR-165019] N82-13492

Measurement of surface recombination velocity for silicon solar cells using a scanning electron microscope with pulsed beam
[JPL-PUB-81-64] N82-13494

Large area sheet task: Advanced dendritic web growth development
[NASA-CR-165013] N82-13497

Development of technique for AR coating and nickel and copper metallization of solar cells: FPS project, product development
[NASA-CR-165033] N82-13499

High resolution, low cost solar cell contact development
[NASA-CR-165032] N82-13501

Design, fabrication, test, qualification, and price analysis of third generation design solar cell modules
[NASA-CR-165007] N82-13502

Investigation of test methods, material properties, and processes for solar cell encapsulants
[NASA-CR-165031] N82-13503

Silicon solar cell optimization
[AD-A106005] N82-13514

Development of high-efficiency cascade solar cells
[DE81-029633] N82-13540

Design procedures for a commercial scale thermal evaporation system to deposit CdS for solar cell manufacture N82-13551

Electron Beam-Induced Current (EBIC) measurements of heat treated polycrystalline cuprous sulfide/cadimum sulfide solar cells N82-13552

Fundamental studies of grain-boundary passivation in polycrystalline silicon with application to improved photovoltaic devices
[DE82-000825] N82-13956

SOLAR COLLECTORS

Dish stirling solar receiver combustor test program
[NASA-CR-165017] N82-13495

Inexpensive thermographic techniques for determining reliable solar-collector-array performance
[DE82-001151] N82-13528

Solar-central-receiver fuels and chemicals
[DE82-000941] N82-13530

SOLAR ECLIPSES

Submillimeter observations of solar limb-brightening in the total solar eclipse of 31 July 1981 N82-14043

SOLAR ENERGY

Inexpensive thermographic techniques for determining reliable solar-collector-array performance
[DE82-001151] N82-13528

Solar-central-receiver fuels and chemicals
[DE82-000941] N82-13530

Intermediate photovoltaic system application experiment operational performance report. Volume 2 for Beverly High School, Beverly, Mass.
[DE82-000811] N82-13532

Passive/hybrid solar components: An approach to standard thermal test methods
[PB81-227886] N82-13549

SOLAR ENERGY ABSORBERS

Aging and corrosion problems with flat solar energy absorbers. Study based upon literature and experiment exchanges
[SP-RAPP-1979/4] N82-13548

SOLAR ENERGY CONVERSION

New and renewable energy in the United States of America
[DE81-030887] N82-13539

SOLAR FLARES

A triggering of solar flare by magnetos[illegible]ic waves in a neutral sheet plasma
[IPPJ-540] N82-14042

SOLAR FURNACES

Design and test of two-step solar oil shale retort
[DE82-000964] N82-13543

SOLAR HEATING

Ultimate in building energy analysis: DOE-2 and BLAST
[DE81-028703] N82-13263

Thermal performance of windows having high solar transmittance
[DE81-028872] N82-13524

SOLAR HOUSES

Appliance efficiency and the solar building
[DE81-029073] N82-13265

Experimental and analytical systems studies of a combined thermal-photovoltaic residential solar system
[DE81-029539] N82-13534

SOLAR OBSERVATORIES

Submillimeter observations of solar limb-brightening in the total solar eclipse of 31 July 1981 N82-14043

SOLAR ORBITS

A systematic program of cometary spectroscopy N82-14005

SOLAR PHYSICS

Solar-geophysical data. Prompt report, part 1
[PB81-221178] N82-14044

Solar-geophysical data. Comprehensive reports, part 2
[PB81-221186] N82-14045

Solar-geophysical data. Explanation of data reports
[PB81-221194] N82-14046

SOLAR REFLECTORS

Evaluation of creep-fatigue life-prediction models for the solar central receiver
[DE82-000942] N82-13529

SOLAR SYSTEM

Reports of Planetary Geology Program, 1981
[NASA-TM-84211] N82-14041

SOLAR THERMAL PROPULSION

Solar thermal energy systems
[DE81-029295] N82-13531

SOLAR TOTAL ENERGY SYSTEMS

Solar thermal energy systems
[DE81-029295] N82-13531

SOLAR WIND

Magnetic clouds between 2-4 AU: Voyager observations
[NASA-TM-83849] N82-13593

The JOCR program --- Joint Observatory for Cometary research N82-14013

Solar-geophysical data. Prompt report, part 1
[PB81-221178] N82-14044

Solar-geophysical data. Comprehensive reports, part 2
[PB81-221186] N82-14045

Solar-geophysical data. Explanation of data reports
[PB81-221194] N82-14046

SOLID LUBRICANTS

Study of methods for applying and enhancing transfer film coatings of polytetrafluoroethylene (PTEE) to Space Shuttle Main Engine (SSME) High Pressure Oxygen Turbo Pump (HPOTP) bearings
[NASA-CR-161916] N82-13428

SOLID SOLUTIONS

Ultrasonic attenuation and velocity studies in the alpha-alpha' solid solution phases of the Nb-H system
[DE81-026618] N82-13836

SOLID STATE DEVICES

High voltage DC switchgear development for multi-kW space power system: Aerospace technology development of three types of solid state power controllers for 200-1100VDC with current ratings of 25, 50, and 80 amperes with one type utilizing an electromechanical device
[NASA-CR-165413] N82-13357

Transport noise arising from diffusion and bulk or surface generation recombination in semiconductors N82-13963

SOLID WASTES

Power-plant fly-ash utilization: A chemical-processing perspective
[DE81-025452] N82-13191

SOLIDIFICATION

A quantitative study of factors influencing lamellar eutectic morphology during solidification
[NASA-TM-82451] N82-13218

Rapid cycle casting of steel
[AD-A103567] N82-13260

SOLIDIFIED GASES

Observational data needs useful for modeling the coma N82-13991

SOLIDS

Numerical methods for the analysis of fluid-structure interaction problems N82-13381

On the vibrational energy transfer processes of polyatomic molecules in the gas and solid phases N82-13865

Data on the backscattering coefficients of light ions from solids
[IPPJ-AM-18] N82-13907

SOLIDS FLOW

Laboratory measurements of physical, chemical, and optical characteristics of Lake Chicot sediment waters
[NASA-TP-1941] N82-13468

SOLUBILITY

Solubilities of dissolved gases in sea water
[AD-A100675] N82-13189

Solubilities in multicomponent systems of nonspecific interactions N82-13205

Insoluble anodes for electrowinning zinc and other metals
[PB81-227365] N82-13227

SOLUTES

Studies of photoionization in liquids using a laser two-photon ionization conductivity technique
[DE81-026514] N82-13194

SOLUTIONS

A study of the dynamic and transient properties of polymer solutions N82-13241

SOLVENT REFINED COAL

Synthetic fuel aromaticity and staged combustion
[DE81-024205] N82-13246

SOLVENTS

Effect of solvents on the radiation-induced polymerization of ethyl and isopropyl vinyl ethers N82-13238

SOOT

Gas turbine combustor soot and radiation N82-13174

SOUND PROPAGATION

Propagation of sound through the Earth's atmosphere
[NASA-CR-165008] N82-13828

Laboratory study of sound propagation into a fast bottom medium
[AD-A104596] N82-13831

SOUND TRANSDUCERS

Thin magnetic impedance antennas N82-13314

SOUND TRANSMISSION

Measurement of sound absorption in the air --- data procesing N82-13829

Detection of infrasound generated by Clear Air Turbulence (CAT) N82-13830

Transmission of sound across a vortex layer enclosing a cylindrical column of jet N82-13838

SOUND WAVES

Investigation of acoustic interactions in jet thrust augmenting ejectors
[AD-A106083] N82-13835

SPACE COMMUNICATION

Technical basis for efficient management of geostationary satellite orbit/spectrum N82-13159

Microwave attenuation and brightness temperature due to the gaseous atmosphere: A comparison of JPL and CCIR values
[NASA-CR-165027] N82-13300

SPACE COOLING (BUILDINGS)
Annual cycle energy system experimental performance and national applicability
[DE81-028570] N82-13523
SPACE ERECTABLE STRUCTURES
Shape determination and control for large space structures
[JPL-PUB-81-71] N82-13166
SPACE HEATING (BUILDINGS)
Electric coheating experiment to determine the heat-loss coefficient of a double-envelope house
[DE81-027937] N82-13264
Annual cycle energy system experimental performance and national applicability
[DE81-028570] N82-13523
Intermediate photovoltaic system application experiment operational performance report. Volume 2 for Beverly High School, Beverly, Mass.
[DE82-000811] N82-13532
High altitude testing of residential wood-fired combustion equipment
[PB81-226151] N82-13575
SPACE LABORATORIES
SEPAC software configuration control plan and procedures, revision 1
[NASA-CR-161915] N82-13765
SPACE MISSIONS
Anticipated results from dust experiments on cometary missions N82-13993
The ESA mission to Comet Halley N82-14025
SPACE PROBES
Anticipated results from dust experiments on cometary missions N82-13993
SPACE PROCESSING
A preliiminary analysis of the data from experiment 77-13 and final report on glass fining experiments in zero gravity
[NASA-CR-161884] N82-13154
SPACE SHUTTLE MAIN ENGINE
Study of methods for applying and enhancing transfer film coatings of polytetrafluoroethylene (PTEE) to Space Shuttle Main Engine (SSME) High Pressure Oxygen Turbo Pump (HPOTP) bearings
[NASA-CR-161916] N82-13428
SPACE SHUTTLE ORBITERS
Force and moment, flow-visualization, and boundary-layer tests on a shuttle orbiter model at Mach 6
[NASA-TP-1952] N82-13106
Analysis of a longitudinal pilot-induced oscillation experienced on the approach and landing test of the space shuttle
[NASA-TM-81366] N82-13149
Near perihelion observations of Comet Halley from Shuttle orbiter N82-14021
SPACE SHUTTLE PAYLOADS
Concept and feasibility study (phase A) for the X-ray satellite ROBISAT. Executive summary
[BMFT-FB-W-80-027] N82-13164
Voice control of the space shuttle video system N82-13719
SPACE TRANSPORTATION SYSTEM
Report on research and technology-FY 1981
[NASA-TM-81367] N82-14047
SPACE-TIME FUNCTIONS
Curvature singularities in certain space-times N82-13824
New exact and asymptotic solutions of the stationary vacuum Einstein equations N82-13973
SPACEBORNE ASTRONOMY
Infrared experiments for spaceborne planetary atmospheres research. Full report
[NASA-TM-84414] N82-13876
Infrared experiments for spaceborne planetary atmospheres research. Executive summary
[NASA-TM-84413] N82-13877
Ultraviolet spectroscopy of comets using sounding rockets, IUE and Spacelab N82-14009
SPACECRAFT COMMUNICATION
Modulation/demodulation techniques for satellite communications. Part 1: Background
[NASA-CR-165020] N82-13301
Investigation of modulation methods and system aspects for regenerative satellite-repeater
[BMFT-FB-W-80-024] N82-13342
SPACECRAFT CONTROL
Design and development of a six degree of freedom hand controller N82-13706
SPACECRAFT DESIGN
Statistical energy analysis computer program, user's guide
[NASA-CR-161913] N82-13764
SPACECRAFT LAUNCHING
Launch mission summary: Intelsat 5 (F3) Atlas/Centaur-55
[NASA-TM-84068] N82-13161
Mission operation report: INTELSAT V-C(F-3)
[NASA-TM-84072] N82-13162
SPACECRAFT ORBITS
Regularized integration of gravity-perturbed trajectories: A numerical efficiency study N82-13155
SPACECRAFT POWER SUPPLIES
Space applicable DOE photovoltaic technology: An update
[NASA-CR-165021] N82-13491
SPACECRAFT PROPULSION
Space applicable DOE photovoltaic technology: An update
[NASA-CR-165021] N82-13491
SPACECRAFT TRAJECTORIES
Regularized integration of gravity-perturbed trajectories: A numerical efficiency study N82-13155
Launch mission summary: Intelsat 5 (F3) Atlas/Centaur-55
[NASA-TM-84068] N82-13161
SPACELAB
Ultraviolet spectroscopy of comets using sounding rockets, IUE and Spacelab N82-14009
SPATIAL RESOLUTION
Detection of trace gases using high resolution spectroscopy
[AD-A104841] N82-13883
SPECKLE PATTERNS
Acoustical speckle interferometry and applications in experimental mechanics N82-13826
SPECTRAL BANDS
An investigation of warm carbon stars N82-14033
SPECTRAL LINE WIDTH
Composition dependence of neodymium optical homogeneous linewidths in glasses N82-13945
SPECTRAL REFLECTANCE
DMSP water vapor radiances: A preliminary evaluation
[AD-A099305] N82-13625
SPECTRAL RESOLUTION
A possible technique for cometary studies with high angular and spectral resolution N82-14012
SPECTRAL SIGNATURES
Laboratory measurements of physical, chemical, and optical characteristics of Lake Chicot sediment waters
[NASA-TP-1941] N82-13468
Spectral imagery: Recent results with the SPIFI and their implications for cometary atmospheric studies --- servocontrolled polarimetric imaging Fabry-Perot interferometer N82-14011
SPECTRAL THEORY
Theory and calculation of Raman line shapes and excitation profiles near a one photon resonance N82-13866
SPECTROMETERS
Double beam-in-time photoacoustic spectroscopy N82-13180
High-temperature measurements of alkali levels in an experimental 6-inch AFBC
[DE81-023632] N82-13193
SPECTROPHOTOMETRY
Ground-based photometry of comets in the spectral interval 3000 to 3500 angstrom N82-13997
Spectrophotometry of faint comets: The asteroid approach N82-13998
Infrared observations of comets N82-14000
Infrared observations of faint comets N82-14001
A systematic program of cometary spectroscopy N82-14005
Observations of faint comets at McDonald Observatory: 1978-1980 N82-14010
Narrow passband imagery of comets --- Comet West N82-14014
SPECTROSCOPIC ANALYSIS
Background fitting for electron energy-loss spectra
[DE81-027117] N82-13855
Laboratory Research --- spectroscopic analysis, photochemical reactions, and proton irradiation of ice N82-14022
SPECTROSCOPIC TELESCOPES
Observing facilities at the European Southern Observatory (ESO) in Chile for cometary observations N82-14006
SPECTROSCOPY
Current transient spectroscopy of deep levels in silicon N82-13929
Introductory remarks: Photometry section N82-13998
SPECTRUM ANALYSIS
Energy spectral analysis in projection radiography N82-13293
Spectra over complex terrain
[DE81-028734] N82-13473
Steenrod operations in spectral cohomology theories
[CTH-MATH-1981-06] N82-13802
Inclusive charged particle spectrum from the interaction of nuclei with intermediate energy proton N82-13848
Theory and calculation of Raman line shapes and excitation profiles near a one photon resonance N82-13866
Determination of optical constants from extinction measurements
[AD-A099494] N82-13882
Spectral functions in quantum chromodynamics and applications N82-13969
Observations of faint comets at McDonald Observatory: 1978-1980 N82-14010
SPEECH RECOGNITION
Using voice control onboard combat aircraft N82-13056
Voice control of the space shuttle video system N82-13719
Application of computer voice input/output
[DE81-028769] N82-13743
SPEED CONTROL
Controlled Speed Accessory Drive demonstration program
[NASA-CR-165010] N82-13981
SPHERICAL COORDINATES
Generation of orthogonal and nearly orthogonal boundary-fitted coordinates with direct control of grid spacing
[LOG-J12610] N82-13790
SPIN STABILIZATION
Scanner --- photography from a spin stabilized synchronous satellite
[NASA-CASE-GSC-12032-2] N82-13465
SPIN TESTS
Two-channel telemeter for use in a 3-inch spin air gun
[AD-A102566] N82-13165
SPOILERS
Wind-tunnel investigation of the tail-spoiler concept for stall-prevention on general aviation airplanes
[NASA-TM-83208] N82-13047
SPORADIC E LAYER
JASPIC-DIP: The digital impedance probe in the JASPIC project
[BMFT-FB-W-80-034] N82-13169
SPRAY NOZZLES
Controlled overspray spray nozzle
[NASA-CASE-MFS-25139-1] N82-13376
High-pressure shrouded water sprays for dust control
[PB81-231458] N82-13483
SPUTTERING
Outer-shell excitation in sputtered atoms N82-13839
SQUID (DETECTORS)
Superconducting magnetometry for cardiovascular studies and an application of adaptive filtering N82-13648
STABILITY
Thermoelastic instability in a seal-like configuration N82-13436
STABILITY DERIVATIVES
Interactive aircraft flight control and aeroelastic stabilization --- forward swept wing flight vehicles
[NASA-CR-165036] N82-13150
STABILITY TESTS
Wind-tunnel investigation of the tail-spoiler concept for stall-prevention on general aviation airplanes
[NASA-TM-83208] N82-13047
STACKS
Flow characteristics of a multiple nozzle exhaust gas eductor system
[AD-A104072] N82-13387

Cell module and fuel conditioner development
[NASA-CR-165462] N82-13511
STAGNATION FLOW
Effects of intake geometry on circular pitot intake performance at zero and low forward speeds N82-13070
STAGNATION PRESSURE
Pressure distributions on three different cruciform aft-tail control surfaces of a wingless missile at Mach 1.60, 2.36, and 3.70. Volume 1: Trapezoidal tail
[NASA-TM-80097] N82-13110
STAINLESS STEELS
Fatigue crack initiation and electrochemical behavior of 403 stainless steel in aqueous environments N82-13210
Substructure of 316 stainless steel pipe weldments --- liquid metal fast breeder reactor materials N82-13215
Stress corrosion cracking of type 304 stainless steel in high temperature dilute chloride solution N82-13228
Materials studies for magnetic fusion energy applications at low temperatures -4
[PB81-222507] N82-13928
STANDARDIZATION
A standard control display unit for multi-aircraft application N82-13054
Passive/hybrid solar components: An approach to standard thermal test methods
[PB81-227886] N82-13549
Progress in the global standarization of gravity: An analysis of the Woollard and Rose international gravity values
[AD-A099459] N82-13599
Computer science and technology: NBS Programming Environment Workshop report
[PB81-237869] N82-13744
Survey of standards applicable to a database management system
[NASA-CR-165009] N82-13766
STANDARDS
Digital Equipment Corporation VAX-11 FORTRAN, version 2
[PB81-232431] N82-13745
Digital Equation Corporation PDP-11 COBOL, version 4.1
[PB81-232423] N82-13746
COBOL compiler: Northern Telecom, Inc. NTI COBOL/3
[PB81-226417] N82-13749
STARS
Optical brightness variations in a sample of nineteen radio-quiet quasi-stellar objects N82-14030
STARTING
Heat pipe startup from the supercritical state N82-13400
STATIC LOADS
MAGNA: A finite element program for the materially and geometrically nonlinear analysis of three-dimensional structures subjected to static and transient loading
[AD-A099454] N82-13448
Endurance test and evaluation of alkaline water electrolysis cells
[NASA-CR-165424] N82-13508
STATISTICAL ANALYSIS
Ionospheric scintillation N82-13585
Project Skywater: Fiscal year 1979 report. Atmospheric Resources Research Program
[PB81-234494] N82-13629
An investigation into pilot and system response to critical in-flight events, volume 1
[NASA-CR-166243-VOL-1] N82-13662
An investigation into pilot and system response to critical in-flight events, volume 2
[NASA-CR-166243-VOL-2] N82-13663
Statistical energy analysis computer program, user's guide
[NASA-CR-161913] N82-13764
The relationship between the number of factors and size of an experiment --- a medical diagnostics case
[AD-A103877] N82-13792
A contribution to robust detection and estimation N82-13809
Transforming contingency tables
[AD-A104182] N82-13821
STATISTICAL DECISION THEORY
Detecting human operator impairment with a psychomotor task N82-13718
STATISTICAL DISTRIBUTIONS
Lagrangian fluid dynamics using the Voronoi-Delaunay mesh
[LA-UR-81-1421] N82-13393
Some small sample non-parametric space-time clustering tests N82-13811
Sequential stochastic construction of random polygons N82-13812
STATISTICAL TESTS
Some small sample non-parametric space-time clustering tests N82-13811
STATISTICAL WEATHER FORECASTING
National Weather Service public forecast verification
[PB81-231714] N82-13632
STEADY STATE
A synthesis method for estimating maximum instantaneous inlet distortion based on measured inlet steady state and RMS pressures N82-13083
A simplified two-dimensional numerical analysis of MOS devices including transient penomena N82-13372
Transient catalytic combustor model
[NASA-CR-165324] N82-13507
Radiatively cooled stellar winds N82-14034
STEAM FLOW
Hydrodynamic computations of pressures generated by steam pipe rupture
[AD-A102046] N82-13449
STEAM TURBINES
Assessment of rotor-bearing dynamics: A planning study for the utility industry
[DE82-900378] N82-13430
STEEL STRUCTURES
Optimum Design of Static, Earthquake, and Wind Steel Structures (ODSEWS-2D)
[PB81-232738] N82-13271
Welding of austenitic stainless steels for liquid-helium service
[DE81-025602] N82-13429
Analysis of steel beam-to-colur moment connections N82-13444
Load and resistance factor design of cold-formed steel structural members N82-13464
Theory and application of experimental model analysis in earthquake engineering N82-13588
STEELS
Acoustic nondestructive evaluation of microstructure --- pure copper and plain carbon and low alloy steels N82-13211
Cyclic deformation and fatigue microcrack initiation in pearlitic eutectoid steel N82-13230
Anamolous loss in transformer steels N82-13371
STEERING
A data collection scheme for identification of parameters in a driver model N82-13696
Manual control analysis of drug effects on driving performance N82-13709
Stability analysis of automobile driver steering control N82-13717
STELLAR ATMOSPHERES
X-ray and ultraviolet observations of stellar atmospheres N82-14029
STELLAR EVOLUTION
Evolution of close binary systems: Observational aspects
[NASA-CR-165039] N82-14027
Radiation-hydrodynamics of HII regions and molecular clouds
[DE81-028696] N82-14032
STELLAR LUMINOSITY
Optical brightness variations in a sample of nineteen radio-quiet quasi-stellar objects N82-14030
STELLAR MASS
Problems in quantum mechanics and gravitation N82-13970
STELLAR ROTATION
The transfer of polarized radiation in spectral lines from rotationally distorted stars N82-14031
STELLAR SPECTROPHOTOMETRY
Astronomical activities report
[ISSN-0531-4496] N82-14028
STELLAR WINDS
Radiatively cooled stellar winds N82-14034
STELLARATORS
Enhanced-confinement class of stellarators
[DE81-028727] N82-13924
STEPPING MOTORS
Scanner --- photography from a spin stabilized synchronous satellite
[NASA-CASE-GSC-12032-2] N82-13465
STIFFNESS
Optimum Design of Static, Earthquake, and Wind Steel Structures (ODSEWS-2D)
[PB81-232738] N82-13271
STIRLING CYCLE
Dish stirling solar receiver combustor test program
[NASA-CR-165017] N82-13495
STOCHASTIC PROCESSES
A stochastic extension of the structural properties of compartment models via a Kronecker algebra N82-13810
Sequential stochastic construction of random polygons N82-13812
A stochastic Langevin dynamics study of correlated ionic motion in one-dimensonal framework solid electrolytes N82-13966
STOICHIOMETRY
Testing and evaluation of MHD materials and substructures
[DE81-024331] N82-13926
STOKES LAW (FLUID MECHANICS)
On a dusty-gas shock tube
[UTIAS-250] N82-13151
STORAGE RINGS (PARTICLE ACCELERATORS)
Construction and maintenance of SUNY facilities at the National Synchrotron Light Source
[DE81-027855] N82-13152
STORAGE STABILITY
Test number 2 of propellants for rocket motor E573
[FOA-C-20411-D1] N82-13254
STORAGE TANKS
Parametric study of silo-material interaction N82-13259
STORMS (METEOROLOGY)
Spring program summary, 1980
[PB81-234940] N82-13628
STRAIN ENERGY METHODS
Study of corrugated plates N82-13426
STRAIN GAGES
Moment-strain relationships in elastic-plastic bending of beams
[AD-A101722] N82-13446
Pressure measurements of non-planar stress waves --- dual element strain gage
[DE81-028729] N82-13454
STRAIN RATE
Large amplitude compression and shear wave propagation in impact-loaded PMMA
[AD-A105953] N82-13450
Analysis of stress drop in multistage creep experiments: Predictions of exponential creep law
[DE81-029279] N82-13453
STRATIFICATION
Mixed layer depth distributions from SVSTD data
[AD-A105669] N82-13834
STRATIGRAPHY
The trace metal stratigraphy and recent sedimentary history of anthrogenous particulates on the San Pedro Shelf, California N82-13579
Structural and stratigraphic analysis of the paleozoic Murzuk and Ghadames basins, western Libya N82-13614
STRATOSPHERE RADIATION
SAM 2 measurements of the polar stratospheric aerosol, volume 1: October to April 1979
[NASA-RP-1081] N82-13592
STREAM FUNCTIONS (FLUIDS)
An experimental investigation of the turbulent flow in the junction of a flat plate and a body of constant thickness N82-13102
Computational methods for internal flows with emphasis on turbomachinery
[NASA-TM-82764] N82-13113
STREAMLINED BODIES
Turbulent wake development behind streamlined bodies N82-13104
STREAMS
Preliminary investigation of a shallow ground-water flow system associated with Connetquot Brook, Long Island, New York
[PB81-228751] N82-13481
A depositional model for major coal seams in the Rock Springs Formation, Upper Cretaceous, southwest Wyoming N82-13580

STRESS (PHYSIOLOGY)
Determination of efficient methods of lift by comparing trained and untrained male and female lifters
[AD-A100349] N82-13650

STRESS ANALYSIS
Effective stress-strain-strength behavior of silicate-grouted sand N82-13257
Asymmetric stress and failure analysis
[DE81-026842] N82-13451
Behavior of plane panels in ship structures with local initial deflections
[BMVG-FBWT-80-18] N82-13455
Thin-walled structures. Trapezoidal sheet bending and under shear stresses
[VTT-11] N82-13456
Residual stress and deformation in circumferential pipe-joint welds
[PB81-232464] N82-13458
An integral equation method for cutout problems in shells N82-13459
Single mode optical waveguide design investigation
[AD-A098979] N82-13881

STRESS CONCENTRATION
Planning and analysis of a fatigue test programme N82-13276
Elevated temperature fatigue testing of metals N82-13281
Phase separation of a two component electron-hole liquid in (111) stressed Ge N82-13938

STRESS CORROSION
An improved stress corrosion test medium for aluminum alloys
[NASA-TM-82452] N82-13216

STRESS CORROSION CRACKING
Stress corrosion cracking of type 304 stainless steel in high temperature dilute chloride solution N82-13228
Fatigue tests with a corrosive environment N82-13282

STRESS CYCLES
Cyclic deformation and fatigue crack initiation of a coherently precipitating Ni-14.4 at % Al alloy N82-13212
An investigation of notch low cycle fatigue life behavior of Rene' 80 at high temperature N82-13214

STRESS INTENSITY FACTORS
Fatigue crack propagation studies in two cryogenic steels N82-13213

STRESS RELAXATION
Analysis of stress drop in multistage creep experiments: Predictions of exponential creep law
[DE81-029279] N82-13453

STRESS WAVES
Pressure measurements of non-planar stress waves --- dual element strain gage
[DE81-028729] N82-13454

STRESS-STRAIN DIAGRAMS
Dynamic effects on fracture of elastic - plastic materials N82-13463

STRESS-STRAIN RELATIONSHIPS
Effective stress-strain-strength behavior of silicate-grouted sand N82-13257

STRESS-STRAIN-TIME RELATIONS
Analysis of stress drop in multistage creep experiments: Predictions of exponential creep law
[DE81-029279] N82-13453

STRONG INTERACTIONS (FIELD THEORY)
Long-range interactions in lattice field theory N82-13941

STRONTIUM TITANATES
Boron implanted strontium titanate N82-13939

STRUCTURAL ANALYSIS
Parametric study of silo-material interaction N82-13259
A method for accelerating convergence to the solution of nonlinear structural equations by reducing residual work N82-13439
Analysis of steel beam-to-column moment connections N82-13444
Load and resistance factor design of cold-formed steel structural members N82-13464
A stochastic extension of the structural properties of compartment models via a Kronecker algebra N82-13810

STRUCTURAL BASINS
Thermal contraction and flexure of intracratonic basins: A three dimensional study of the Michigan Basin N82-13582
Basement rocks of the main interior basins of the midcontinent
[NASA-CR-164935] N82-13596
Structural and stratigraphic analysis of the paleozoic Murzuk and Ghadames basins, western Libya N82-13614

STRUCTURAL DESIGN
Optimum Design of Static, Earthquake, and Wind Steel Structures (ODSEWS-2D)
[PB81-232738] N82-13271
Design, fabrication, test, qualification, and price analysis of third generation design solar cell modules
[NASA-CR-165007] N82-13502

STRUCTURAL DESIGN CRITERIA
Shape determination and control for large space structures
[JPL-PUB-81-71] N82-13166
Antenna (selected articles)
[AD-B060598] N82-13307
Load and resistance factor design of cold-formed steel structural members N82-13464

STRUCTURAL ENGINEERING
Computer program for optimum nonlinear dynamic design of reinforced concrete slabs under blast loading (CBARCS)
[AD-A104253] N82-13262
Analysis and behavior of structures on discrete tensionless foundations N82-13286
Evaluation of advanced technologies for power transformers
[DE82-000793] N82-13368

STRUCTURAL FAILURE
Asymmetric stress and failure analysis
[DE81-026842] N82-13451

STRUCTURAL MEMBERS
Shape determination and control for large space structures
[JPL-PUB-81-71] N82-13166
On the modeling and control of flexible space structures N82-13168
Laser heat treatment of track components in combat vehicles, phase 1
[AD-A102761] N82-13219

STRUCTURAL PROPERTIES (GEOLOGY)
The crustal structure of Kilauea and Mauna Loa volcanoes, Hawaii, from seismic refraction and gravity data N82-13583
Surface waves in strong ground motion with application to offshore environments N82-13584
Structural and stratigraphic analysis of the paleozoic Murzuk and Ghadames basins, western Libya N82-13614
Two detailed seismic studies in Central California. Part 1: Earthquake clustering and crustal structure studies of the San Andrea fault near San Juan Bautista. Part 2: Seismic velocity structure along the Sierra foothills near Oroville, California N82-13617
Reports of Planetary Geology Program, 1981
[NASA-TM-84211] N82-14041

STRUCTURAL STRAIN
Planning and analysis of a fatigue test programme N82-13276

STRUCTURAL VIBRATION
Analysis of a longitudinal pilot-induced oscillation experienced on the approach and landing test of the space shuttle
[NASA-TM-81366] N82-13149
Shape determination and control for large space structures
[JPL-PUB-81-71] N82-13166
On the modeling and control of flexible space structures N82-13168
Structural dynamics: Modified calculations --- natural and harmonically excited vibrations of modified structures; increased computation efficiency
[BMVG-FBWT-81-1] N82-13457

STRUCTURAL WEIGHT
Weight reduction potential of automobiles and light trucks: 1980 summary source document
[PB81-235756] N82-13987

STURM-LIOUVILLE THEORY
High order approximations to Eigensolutions of Sturm-Liouville problems by deferred corrections
[TRITA-NA-8104] N82-13800

SUBMARINES
A model for the submarine depthkeeping team N82-13689

SUBMILLIMETER WAVES
Antenna (selected articles)
[AD-A106499] N82-13323
A statistical analysis of irregular quasi-optical lines (beam guides) with the aid of computer(s) N82-13324
Directed dividers on the metal-dielectric waveguides N82-13326

SUBROUTINES
Digital equipment corporation, PDP-11 COBOL version, 4.1 indexed 1-0 module
[PB81-232415] N82-13747

SUBSIDENCE
Evaluation of reef shell embankment
[PB81-232761] N82-13266
The occurrence and control of land subsidence due to ground water withdrawal with special reference to the San Joaquin and Santa Clara Valleys, California N82-13466

SUBSONIC FLOW
Calculation of wing-body-nacelle interference in subsonic and transonic potential flow N82-13095
Prediction of subsonic aircraft flows with jet exhaust interactions N82-13096

SUBSONIC SPEED
Thrust modulation methods for a subsonic V/STOL aircraft
[NASA-TM-82747] N82-13112

SUBSONIC WIND TUNNELS
Studies of air inlets at Reynolds numbers comparable to flight in ONERA's F1 and S1MA wind tunnels N82-13091

SUBSTRATES
Transient catalytic combustor model
[NASA-CR-165324] N82-13507
Laboratory study of sound propagation into a fast bottom medium
[AD-A104596] N82-13831

SULFATES
Energy generation and the sulfur-carbon cycle
[DE81-030949] N82-13562
Aircraft data summaries for the SURE intensives, volume 6
[DE82-900355] N82-13563

SULFIDES
Resonance Raman spectroscopic investigations of the active site structures of hemoglobin and hemerythrin N82-13176
Energy generation and the sulfur-carbon cycle
[DE81-030949] N82-13562

SULFONIC ACID
Gas-solid chromatography on cation forms of lightly sulfonated porous polymers N82-13237

SULFUR
Spectroelectrochemical investigations in molten salt and aqueous media N82-13183

SULFUR COMPOUNDS
Metal ion modification of polymeric sulfur nitride, (SN) subx, electrodes and electrochemical reduction of acetylene at a molybdenum modified (SN)sub x electrode N82-13185

SULFUR FLUORIDES
A study of the formation and structure of small clusters of noble gases and sulfur hexafluoride formed in Laval Nozzle molecular beams N82-13201

SULFUR ISOTOPES
Trapped ion research
[AD-A098648] N82-13188

SULFUR OXIDES
Sulfur in the air in the capital (Helsinki) metropolitan area: ITASAT-project
[RR-614.71] N82-13553

SULFURIC ACID
Insoluble anodes for electrowinning zinc and other metals
[PB81-227365] N82-13227

SUM RULES
On general 1 exp p summability methods
[CTH-MATH-1981-07] N82-13803

SUPERCONDUCTING MAGNETS
Welding of austenitic stainless steels for liquid-helium service
[DE81-025602] N82-13429
Computer-automated controls for superconducting magnetic energy storage
[DE81-028697] N82-13521

Materials studies for magnetic fusion energy applications at low temperatures -4
[PB81-222507] N82-13928

SUPERCONDUCTING POWER TRANSMISSION
Cryogenic testing of 100-m superconducting power transmission test facility
[DE81-028331] N82-13517

SUPERCONDUCTIVITY
Superconductivity of the A15 compound niobium aluminum N82-13932
Observation of high field DHVA effect and induced magnetism in single crystal TiBe sub 2
[DE81-025292] N82-13950

SUPERCONDUCTORS
Upper critical fields and span states in A-15 superconductors, part 1. Vortices in two-dimensional superconductors, part 2 N82-13942
Electron beam evaporation of superconducting, A15 niobium-silicon N82-13944

SUPERCRITICAL FLOW
The influence of closed-coupled, rear fuselage mounted nacelles on the design of an advanced high speed wing N82-13092

SUPERCRITICAL WINGS
The influence of closed-coupled, rear fuselage mounted nacelles on the design of an advanced high speed wing N82-13092

SUPERGIANT STARS
Evolution of close binary systems: Observational aspects
[NASA-CR-165039] N82-14027

SUPERSONIC AIRCRAFT
Aerodynamics of Power Plant Installation
[AGARD-CP-301] N82-13065
Performance of highly integrated inlets for supersonic aircraft N82-13066
Top-mounted inlet system feasibility for transonic-subsonic fighter aircraft applications N82-13067

SUPERSONIC COMBUSTION
Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-field
[NASA-TM-82750] N82-13908

SUPERSONIC COMBUSTION RAMJET ENGINES
Numerical analysis of the scramjet-inlet flow field by using two-dimensional Navier-Stokes equations
[NASA-TP-1940] N82-13142

SUPERSONIC FLOW
Crossflow effects on steady and fluctuating pressures on an ogive-cylinder cone-frustum model in supersonic separated flow
[NASA-TP-1951] N82-13108
A calculation method for slender wing-body configurations in supersonic flow at high angles of attack --- nonlinear force and pitching moment characteristics
[BMVG-FBWT-79-15] N82-13115

SUPERSONIC INLETS
Performance of highly integrated inlets for supersonic aircraft N82-13066
Calculation of transonic air-intakes using a computer package for inviscid and boundary layer flows N82-13072
The design and development of the Tornado engine air intake N82-13074

SUPERSONIC NOZZLES
Navier-Stokes solutions for a supersonic coflowing axisymmetric nozzle with a thick annulus N82-13101

SUPERSONIC SPEEDS
Pressure distributions on three different cruciform aft-tail control surfaces of a wingless missile at Mach 1.60, 2.36, and 3.70. Volume 1: Trapezoidal tail
[NASA-TM-80097] N82-13110

SURFACE ACOUSTIC WAVE DEVICES
Investigation of photoacoustorefractive effect in LiNbO sub 3 SAW devices
[AD-A103705] N82-13880

SURFACE DEFECTS
Methods of obtaining crack growth data in metals N82-13283

SURFACE FINISHING
Investigations towards the understanding of surface treatment of propellant grains by means of trace elements
[BMVG-FBWT-79-14] N82-13253
Preliminary evaluation of ion implantation as a surface treatment to reduce wear of tool bits
[AD-A105053] N82-13261
Mitigation of biofouling using coatings
[DE81-027900] N82-13647

SURFACE LAYERS
Reduction of nitric oxide in a fluidized bed
[DE81-030488] N82-13198
The nitrogen cycle and heat budget of a subtropical lagoon, Devils Hole, Harrington Sound, Bermuda: Implications for nitrous oxide production and consumption in marine environments N82-13611
A review of one-dimensional oceanic mixed-layer models
[AD-A103279] N82-13640

SURFACE PROPERTIES
Conduction and charge storage in electron irradiated spacecraft insulators
[AD-A104796] N82-13167
Spectra over complex terrain
[DE81-028734] N82-13473
Intermediate band surface photometry of elliptical galaxies N82-14035

SURFACE REACTIONS
Surface characterization of dispersed supported metal catalysts using a 'time lapse' dynamic pulse technique N82-13177
A study of the surface reactivity of silver: An acid base characterization of oxidation reactions N82-13233
Measurement of surface recombination velocity for silicon solar cells using a scanning electron microscope with pulsed beam
[JPL-PUB-81-64] N82-13494
Electric field-enhanced diffusion and electron stimulated desorption of alkali elements from glass surfaces during electron bombardment and Auger electron analysis N82-13961

SURFACE ROUGHNESS
The effect of rotor blade thickness and surface finish on the performance of a small axial flow turbine
[NASA-TM-82726] N82-13114
An experimental study of turbulence in an urban environment N82-13618
Acoustic boundary wave generation and shadowing at a seamount
[AD-A104594] N82-13832

SURFACE ROUGHNESS EFFECTS
Optical polishing of metals
[DE81-028690] N82-13225
Influence of wall roughness, adverse pressure gradient and heat transfer on wall shear stress measurements with Preston tubes
[ILR-50] N82-13396

SURFACE TEMPERATURE
Analysis of soil moisture extraction algorithm using data from aircraft experiments
[NASA-CR-166719] N82-13470
Millimeter wave radiometry as a means of determining cometary surface and subsurface temperature N82-14003

SURFACE VEHICLES
Laser heat treatment of track components in combat vehicles, phase 1
[AD-A102761] N82-13219

SURFACE WATER
Spectra over complex terrain
[DE81-028734] N82-13473
The District of Columbia Five-Year Water Resources Research Program Plan, 1982-1987
[PB81-234882] N82-13482

SURFACE WAVES
Surface waves in strong ground motion with application to offshore environments N82-13584

SURFACTANTS
Molecular interactions in amphiphilic association structures N82-13206
Microemulsions, emulsions and related systems: Energy applications N82-13545

SURGES
Current transient spectroscopy of deep levels in silicon N82-13929

SUSPENDING (MIXING)
Colloidal properties of coagulated calcium-montmorillonite suspensions N82-13609

SWEPT FORWARD WINGS
Interactive aircraft flight control and aeroelastic stabilization --- forward swept wing flight vehicles
[NASA-CR-165036] N82-13150

SWITCHING CIRCUITS
Electronic master monitor and advisory display system test and demonstration report
[AD-A105317] N82-13141

SWITCHING THEORY
Three-stage commutation field of the system of the repeated use of short-wave receiving antennas N82-13317

SYMMETRICAL BODIES
Turbulent wake development behind streamlined bodies N82-13104

SYNAPSES
Neurotransmitter function in the basal ganglia after acute and chronic ethanol treatment
[AD-A103744] N82-13649

SYNCHRONISM
A difference in efficiency between synchronous and asynchronous systems
[AD-A102280] N82-13742
Complexity of communication among asynchronous parallel processes N82-13760

SYNCHRONOUS SATELLITES
Effects of the Satellite Power System on low Earth orbit and geosynchronous satellites
[PB81-232019] N82-13157

SYNCHROTRON RADIATION
Construction and maintenance of SUNY facilities at the National Synchrotron Light Source
[DE81-027855] N82-13152

SYNTAX
Language, computation, and reality N82-13757
Preliminary analysis of a breadth-first parsing algorithm: Theoretical and experimental results
[AD-A101852] N82-13797

SYNTHESIS (CHEMISTRY)
Grafting of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole onto polymers with aliphatic groups. Synthesis and polymerization of 2 (2-hydroxy-5-isopropenylphenyl) 2H-benzotriazole and a new synthesis of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole
[NASA-CR-165016] N82-13171

SYNTHETIC ARRAYS
Solution of the problem of the synthesis of antennas with the aid of a coherent optical system N82-13313

SYNTHETIC FUELS
Barriers to the utilization of synthetic fuels for transportation
[NASA-CR-165517] N82-13243
Feasibility study report for the Imperial Valley Ethanol Refinery: A 14.9-million-gallon-per-year ethanol synfuel refinery utilizing geothermal energy
[DE82-000288] N82-13252

SYSTEM FAILURES
Electronic master monitor and advisory display system test and demonstration report
[AD-A105317] N82-13141
Sensor failure detection system --- for the F100 turbofan engine
[NASA-CR-165515] N82-13145

SYSTEMS ANALYSIS
Development, analysis and control of the inductor-converter bridge N82-13349
Supervisory control of remote manipulation: A preliminary evaluation N82-13675
An analytical study of multiprocessor system reliability N82-13728

SYSTEMS ENGINEERING
The intelligent use of intelligent systems: Problems in engineering man/machine symbiosis N82-13058
Design for active and passive flutter suppression and gust alleviation
[NASA-CR-3482] N82-13147
Control design for parameter sensitivity reduction in linear regulators: Application to large flexible space structures N82-13158
Antenna (selected articles)
[AD-B060598] N82-13307
The message processing and distribution system development
[AD-A104585] N82-13333
Frequency sampling filters, design and applications N82-13354
Evaluation of advanced technologies for power transformers
[DE82-000793] N82-13368
An integrated approach for the specification and the design of the conceptual level in database systems N82-13730
Transition radiation as an X-ray source N82-13840
Report on research and technology-FY 1981
[NASA-TM-81367] N82-14047

SYSTEMS INTEGRATION
Integration of advanced exhaust nozzles N82-13075
Techniques for interfacing multiplex systems [AD-A101457] N82-13135
Future directions in Navy electronic system reliability and survivability [AD-A102460] N82-13438

SYSTEMS MANAGEMENT
Command-response data transmision to mechanical systems management effect on the crew/system interface N82-13057
Simple geometric algorithms to aid in clearance management for robotic mechanisms N82-13680

SYSTEMS STABILITY
Distributed photovoltaic systems: Utility interface issues and their present status [NASA-CR-165019] N82-13492

T

TABLES (DATA)
Specific gamma-ray dose constants for nuclides important to dosimetry and radiological assessment [DE81-031980] N82-13863

TAIL ASSEMBLIES
Wind-tunnel investigation of the tail-spoiler concept for stall-prevention on general aviation airplanes [NASA-TM-83208] N82-13047
Pressure distributions on three different cruciform aft-tail control surfaces of a wingless missile at Mach 1.60, 2.36, and 3.70. Volume 1: Trapezoidal tail [NASA-TM-80097] N82-13110

TANKER AIRCRAFT
Tanker avionics and aircrew complement evaluation N82-13063

TARGET RECOGNITION
SEASAT equator crossing program [AD-A099442] N82-13156
Decision aids for airborne intercept operations in advanced aircrafts N82-13683
Modeling human tracking error in several different anti-tank systems N82-13699

TARGETS
Some effects of Field Of View (FOV) and target size on lateral tracking at hover N82-13672
A comparison of three programs for the calculation of surface-ratio [FOA-C-20392-D8] N82-13779
Gas target neutron generator studies [UTIAS-251] N82-13850

TASK COMPLEXITY
Evaluation of a pilot workload assessment device to test alternate display formats and control handling qualities N82-13062
Two-D results on human operator perception N82-13697
Dynamic decision-making in multi-task environments: Theory and experimental results [AD-A102055] N82-13740

TAXONOMY
Taxonomy of the human factors in man machine systems N82-13726

TAYLOR INSTABILITY
Rayleigh-Taylor stability for a shock wave-density discontinuity interaction [DE81-028707] N82-13394

TEARING MODE (PLASMAS)
Soft and hard major disruptions in the profile control experiment of the JIPP T-2 Tokamak [IPPJ-547] N82-13902

TECHNOLOGICAL FORECASTING
Air Force technical objective document FY 1982 [AD-A099741] N82-13982

TECHNOLOGY ASSESSMENT
Soviet UCG experience specifically related to field experiments in the United States [DE81-028642] N82-13244
Distributed photovoltaic systems: Utility interface issues and their present status [NASA-CR-165019] N82-13492
Health and safety research division [DE81-026088] N82-13652
Multi-axis manual controllers: A state-of-the-art report N82-13701
Computer science and technology: NBS Programming Environment Workshop report [PB81-237869] N82-13744
The evaluation of technology R&D: A continuing Dilemma [RAND/P-6655] N82-13980
Air Force technical objective document FY 1982 [AD-A099741] N82-13982

TECTONICS
Papers presented to the Conference on the Processes of Planetary Rifting [LPI-CONTRIB-457] N82-13595

TELECOMMUNICATION
Mission operation report: INTELSAT V-C(F-3) [NASA-TM-84072] N82-13162
Two-path model of fading in a high data rate communication channel N82-13292
Digital data compression algorithm performance comparisions: Proposed NATO standard algorithm provides better facsimile in a noisy communications environment than present Tactical Digital Facsimile algorithm [AD-A103159] N82-13737
Error bounds for reconstruction of a function f from a finite sequence (SGN(ft sub i) + x sub i)) [AD-A104477] N82-13795

TELEMETRY
Two-channel telemeter for use in a 3-inch spin air gun [AD-A102566] N82-13165

TELEOPERATORS
Proceedings of the Seventeenth Annual Conference on Manual Control [NASA-CR-165005] N82-13665
Research issues in implementing remote presence in teleoperator control N82-13676
Man/machine interface development for the REMOTEX concept N82-13678
Identification of cognitive factors related to remote work performance using closed circuit TV displays N82-13679
Simple geometric algorithms to aid in clearance management for robotic mechanisms N82-13680

TELEVISION RECEIVERS
Appliance efficiency and the solar building [DE81-029073] N82-13265

TELEVISION SYSTEMS
A digital TV system for the detection of high speed human motion N82-13289
Voice control of the space shuttle video system N82-13719

TELEVISION TRANSMISSION
The development of domestic technology for television transmitting antennas N82-13319

TEMPERATURE DEPENDENCE
A numerical investigation of exhaust plume temperature effects on nonaxisymmetric nozzle/afterbody performance N82-13079
The influence of high temperature on braking --- wheel brakes N82-13433

TEMPERATURE DISTRIBUTION
Effects of restrained thermal movement in a continuous, prestressed concrete bridge without interior expansion joints N82-13461

TEMPERATURE EFFECTS
Effects of hygrothermal conditioning on the dynamic behavior of resin matrix composites N82-13172
Effects of restrained thermal movement in a continuous, prestressed concrete bridge without interior expansion joints N82-13461

TEMPERATURE GRADIENTS
Aircraft data summaries of the SURE intensives, volume 5 [DE82-900310] N82-13570

TEMPERATURE INVERSIONS
Analysis of stress drop in multistage creep experiments: Predictions of exponential creep law [DE81-029279] N82-13453

TEMPERATURE MEASUREMENT
New ways of looking for phase transitions at multi-megabar dynamic pressures [DE81-028771] N82-13223
Electric coheating experiment to determine the heat-loss coefficient of a double-envelope house [DE81-027937] N82-13264
Inexpensive thermographic techniques for determining reliable solar-collector-array performance [DE82-001151] N82-13528

TEMPERATURE MEASURING INSTRUMENTS
Inexpensive thermographic techniques for determining reliable solar-collector-array performance [DE82-001151] N82-13528

TEMPERATURE PROFILES
SAM 2 measurements of the polar stratospheric aerosol, volume 1: October to April 1979 [NASA-RP-1081] N82-13592

TENSILE DEFORMATION
Strengthening phases and deformation mechanisms in dispersion strengthened solid solutions and pure metals N82-13229
Cyclic deformation and fatigue microcrack initiation in pearlitic eutectoid steel N82-13230
Residual stress and deformation in circumferential pipe-joint welds [PB81-232464] N82-13458

TENSILE STRENGTH
Effect of low-temperature irradiation with (n, alpha) helium production on tensile properties of 12 Cr-1 Mo VW-type steels [DE81-028578] N82-13222

TENSILE TESTS
Test number 2 of propellants for rocket motor E573 [FOA-C-20411-D1] N82-13254

TENSOR ANALYSIS
New exact and asymptotic solutions of the stationary vacuum Einstein equations N82-13973

TERMINAL BALLISTICS
On-board data recorder for hard-target weapons [DE81-028645] N82-13408

TERRAIN ANALYSIS
Spectra over complex terrain [DE81-028734] N82-13473

TERRAIN FOLLOWING AIRCRAFT
Information and display requirements for aircraft terrain following N82-13695

TERRESTRIAL RADIATION
Comparison of data inversion techniques for remotely sensed wide-angle observations of Earth emitted radiation [NASA-TP-1924] N82-13620

TEST FACILITIES
Testing of a work bench for handling of explosives in the laboratory [FOA-C-20393-D1] N82-13397
Residual-energy-application program: EAST facility requirements document, volume 1 [DE81-027536] N82-13526
Testing and evaluation of MHD materials and substructures [DE81-024331] N82-13926

TEST FIRING
Two-channel telemeter for use in a 3-inch spin air gun [AD-A102566] N82-13165

TEXAS
Report of survey for McDonald Observatory, Harvard Radio Astronomy Station, and vicinity [PB81-234338] N82-13606

THEORETICAL PHYSICS
Have we found Asymptopia: The ultimate form of physical laws? [DE81-028853] N82-13825

THERMAL CONDUCTIVITY
Gas-turbine critical research and advanced technology support project [NASA-TM-81708] N82-13509

THERMAL CONDUCTIVITY GAGES
A miniature, thin-film thermal conductivity detector for an integrated gas chromatograph N82-13200

THERMAL DECOMPOSITION
Pyrolytic characterization of the organic matter in selected coals and in the Devonian shales of southern West Virginia N82-13578

THERMAL DIFFUSION
A preliminary analysis of the data from experiment 77-13 and final report on glass fining experiments in zero gravity [NASA-CR-161884] N82-13154

THERMAL ENERGY
Geothermal-resource verification for Air Force Bases [DE81-027482] N82-13520
Residual-energy-application program: EAST facility requirements document, volume 1 [DE81-027536] N82-13526

Experimental and analytical systems studies of a combined thermal-photovoltaic residential solar system
[DE81-029539] N82-13534

THERMAL POLLUTION
Deep Ocean Mining Environmental Study. Environmental effects of commercial-scale mining
[PB81-227753] N82-13484

THERMAL PROTECTION
Aerodynamic heating on the corrugated surface of a 10.2 deg half-angle blunted cone at Mach 6.7
[NASA-TP-1928] N82-13383
Air Force technical objective document FY 1982
[AD-A099741] N82-13982

THERMAL STRESSES
Analysis of stress drop in multistage creep experiments: Predictions of exponential creep law
[DE81-029279] N82-13453
Effects of restrained thermal movement in a continuous, prestressed concrete bridge without interior expansion joints N82-13461
Workshop proceedings: U-bend tube cracking in steam generators
[DE81-903765] N82-13515
Statistical analysis of accelerated temperature aging of semiconductor devices
[AD-A099439] N82-13946

THERMIONIC CATHODES
A relativistic magnetron with a thermionic cathode N82-13353

THERMOCLINES
The nitrogen cycle and heat budget of a subtropical lagoon, Devils Hole, Harrington Sound, Bermuda: Implications for nitrous oxide production and consumption in marine environments N82-13611
A review of one-dimensional oceanic mixed-layer models
[AD-A103279] N82-13640

THERMODYNAMIC PROPERTIES
A preliminary analysis of the data from experiment 77-13 and final report on glass fining experiments in zero gravity
[NASA-CR-161884] N82-13154
Solubilities in multicomponent systems of nonspecific interactions N82-13205
Flammability and photo-stability of selected polymer systems N82-13236
Structure-property relationships in segmented elastomers: Small angle X-ray scattering, thermal, and mechanical studies N82-13240
Molecular dynamics calculations for sodium using pseudopotential theory
[DE81-029022] N82-13853

THERMODYNAMICS
Computational methods for internal flows with emphasis on turbomachinery
[NASA-TM-82764] N82-13113
Coexistence of non-registered monolayer and bilayer solid films N82-13931

THERMOELASTICITY
Thermoelastic instability in a seal-like configuration N82-13436

THERMOELECTRIC GENERATORS
Environmental and radiological safety studies: Interaction of (238) PuO2 heat sources with terrestrial and aquatic environments
[DE81-032019] N82-13565

THERMOHYDRAULICS
Assessment of the computer code COBRA/CFTL --- for thermal-hydraulic analysis of simulated gas-cooled fast breeder reactor cores
[DE81-027933] N82-13771

THERMOSETTING RESINS
Thermal performance of windows having high solar transmittance
[DE81-028872] N82-13524

THESES
Compilation of abstracts of dissertations theses, and research papers submitted by candidates for degrees, 1 October 1979 - 30 September 1980
[AD-A104124] N82-13974

THICKNESS
The effect of rotor blade thickness and surface finish on the performance of a small axial flow turbine
[NASA-TM-82726] N82-13114
A depositional model for major coal seams in the Rock Springs Formation, Upper Cretaceous, southwest Wyoming N82-13580

THICKNESS RATIO
An experimental investigation of the turbulent flow in the junction of a flat plate and a body of constant thickness N82-13102

THIN FILMS
Mathematical model of differential reflectometry for use in the investigation of thin film corrosion products N82-13232
Nonlinear optical effects in liquid crystals N82-13937
Fluorescent guest-host effect in scattering liquid crystals and new physical phenomena in thin liquid crystal films N82-13940
Electron beam evaporation of superconducting, A15 niobium-silicon N82-13944
HgCdTe fabrication using directed energy techniques
[AD-A105626] N82-13947
Computer programs for line shape analysis of X-ray diffraction peaks --- thin film analysis
[PB81-227787] N82-13958
The growth and carrier transport properties of sputter deposited GaAs thin films doped with silicon and magnesium N82-13965

THIN PLATES
Thin-walled structures. Trapezoidal sheet bending and under shear stresses
[VTT-11] N82-13456

THREE DIMENSIONAL FLOW
Prediction and measurement of time-variant, three-dimensional flows in military aircraft intakes N82-13069
A numerical method for studying nacelle-jet-airfoil interaction in inviscid three-dimensional flow N82-13094
Numerical methods for the analysis of fluid-structure interaction problems N82-13381
Radiatively cooled stellar winds N82-14034

THREE DIMENSIONAL MOTION
An extension to N dimensions of the Von Karman equations N82-13441
Feasibility study of a procedure to detect and warn of low level wind shear
[NASA-CR-3480] N82-13621

THRUST
Integration of advanced exhaust nozzles N82-13075
Establishment of an experimental technique to provide accurate measurement of the installed drag of close coupled civil nacelle/airframe configurations, using a full span model with turbine powered engine simulators N82-13089

THRUST CONTROL
Development of a miniaturised digital thrust demand unit N82-13055
Thrust modulation methods for a subsonic V/STOL aircraft
[NASA-TM-82747] N82-13112

THRUST REVERSAL
Advanced exhaust nozzle technology N82-13078

THRUST VECTOR CONTROL
Advanced exhaust nozzle technology N82-13078
A real time Pegasus propulsion system model for VSTOL piloted simulation evaluation
[NASA-TM-82770] N82-13144

TIME DIVISION MULTIPLEXING
Short-range communications using diffusely scattered infrared radiation N82-13344
Time dependent recording of images transmitted over optical fibers
[DE81-026599] N82-13889

TIME FUNCTIONS
Time domain waveform inversion of short-period p-waves for nuclear explosion source time functions
[AD-A101123] N82-13598

TIME MEASUREMENT
Fiber optic analog and timing monitoring system for the Antares laser fusion program
[DE81-028799] N82-13925

TIME OPTIMAL CONTROL
Modeling human tracking error in several different anti-tank systems N82-13699

TIME SERIES ANALYSIS
Computational problems in autoregressive moving average (ARMA) models N82-13698

TIME SHARING
Information storage in a decentralized computer system N82-13732

TIN
Upper critical fields and span states in A-15 superconductors, part 1. Vortices in two-dimensional superconductors, part 2 N82-13942

TISSUES (BIOLOGY)
The measurements of fluid shifts and of the tissue compliance along body axis in man
[BMFT-FB-W-80-011] N82-13654

TITANIUM
Titanium response to a nuclear radiation environment
[AD-A102516] N82-13220
Preliminary evaluation of ion implantation as a surface treatment to reduce wear of tool bits
[AD-A105053] N82-13261

TITANIUM BORIDES
Wear properties of electrodeposited titanium diboride coatings
[PB81-233314] N82-13199

TITANIUM COMPOUNDS
Local density studies of electronic structure and bonding in transition metal compounds N82-13936
Observation of high field DHVA effect and induced magnetism in single crystal TiBe sub 2
[DE81-025292] N82-13950

TITANIUM OXIDES
Quantitative investigations of mixed oxidation states of some first row transition metals in insulator matrices by photoelectron spectroscopy N82-13184

TOKAMAK DEVICES
Ion cyclotron resonance heating and its effect on confinement in Tokamaks N82-13896
Energy and momentum deposition to plasmas due to the lower hybrid wave by a finite source
[IPPJ-546] N82-13899
Oxygen transport and line emissions in a tokamak plasma
[IPPJ-544] N82-13900
Toroidal plasma current sustainment by lower hybrid waves in the WT-2 Tokamak
[IPPJ-545] N82-13901
Soft and hard major disruptions in the profile control experiment of the JIPP T-2 Tokamak
[IPPJ-547] N82-13902
Feedback plasma control in hybrid poloidal coil system
[IPPJ-542] N82-13905
Driving force of the ballooning instability
[DE81-023099] N82-13923

TOLLMEIN-SCHLICHTING WAVES
An experimental study of Tollmien-Schlichting wave cancellation --- friction drag reduction N82-13120

TOLUENE
Evaluation of low-chlorine TATB from a production source
[DE81-025474] N82-13249

TOMOGRAPHY
Algorithms for imaging myocardial blood flow using X-ray computed tomography N82-13661

TOPOLOGY
Lagrangian fluid dynamics using the Voronoi-Delaunay mesh
[LA-UR-81-1421] N82-13393
The existence of nonzero maps from injectives to projectives N82-13808
On the relationship between analytical regularization and regularization by surgery N82-13823

TOROIDAL DISCHARGE
Toroidal plasma current sustainment by lower hybrid waves in the WT-2 Tokamak
[IPPJ-545] N82-13901

TOROIDAL PLASMAS
Toroidal plasma current sustainment by lower hybrid waves in the WT-2 Tokamak
[IPPJ-545] N82-13901
Review of recent EBT coupled ring-core stability theory N82-13911
Hot-electron ring stability at the University of Tennessee N82-13914
Numerical solutions of the EBT Radial eigenmode problem N82-13916
Analytical theory of interchange and compressional Alfven instabilities in EBT N82-13918
Kinetic stability analyses in a bumpy cylinder N82-13921
Effect of Beta limits on reactor performance in EBT N82-13922

On high beta equilibria of plasmas in the quasi-uniform current model: Influence of shaping the plasma cross section and of the second order in the inverse aspect ratio
[REPT-81-131] N82-13927

TORQUE
Computational problems in autoregressive moving average (ARMA) models N82-13698

TORQUERS
Experimental results with a six-degree-of-freedom force-reflecting hand controller N82-13707

TORSION
Wind-tunnel investigation of the effects of blade tip geometry on the interaction of torsional loads and performance for an articulated helicopter rotor
[NASA-TP-1926] N82-13107

TOTAL ENERGY SYSTEMS
Develop and test fuel cell powered on-site integrated total energy system. Phase 3: Full-scale power plant development
[NASA-CR-165328] N82-13490

TOXIC HAZARDS
Environmental hazard rankings of pollutants generated in coal gasification processes
[PB81-231698] N82-13576
Metabolism summaries of selected halogenated organic compounds in human and environmental media, a literature survey: First update
[PB81-232811] N82-13655

TRACE CONTAMINANTS
An automated system for global atmospheric sampling using B-747 airliners
[NASA-CR-165264] N82-13554
Detection of trace gases using high resolution spectroscopy
[AD-A104841] N82-13883

TRACE ELEMENTS
Investigations towards the understanding of surface treatment of propellant grains by means of trace elements
[BMVG-FBWT-79-14] N82-13253
Catalog of lunar mare basalts greater than 40 grams. Part 1: Major and trace chemistry, with megascopic descriptions and rock and thin section photographs
[NASA-TM-84065] N82-14040

TRACKING (POSITION)
A comparison of head and manual control for a position-control pursuit tracking task N82-13720

TRACKING FILTERS
AC harmonic filtering using controlled current injection N82-13348

TRAFFIC CONTROL
Measures of effectiveness of transportation systems management
[PB81-233884] N82-13984

TRAILING-EDGE FLAPS
An analytical and experimental study of the steady and unsteady airloads on a wing with oscillating control including a streamlined gap --- wind tunnel test
[DFVLR-FB-81-18] N82-13119
Unsteady aeroelastic modeling and trailing-edge flap control of an experimental wing in a two dimensional wind tunnel N82-13122

TRAINING EVALUATION
American Airlines LOFT evaluation program N82-13130
Group 3: Performance evaluation and assessment N82-13133

TRAINING SIMULATORS
Guidelines for line-oriented flight training, volume 2
[NASA-CP-2184-VOL-2] N82-13123
Issues related to line-oriented flight training N82-13124
Line-oriented flight training: Northwest Airlines N82-13125
United Airlines LOFT training N82-13126
Eastern Airlines LOFT program N82-13127
Texas International Airlines LOFT program N82-13128
Delta Airlines LOFT training N82-13129
American Airlines LOFT evaluation program N82-13130
Group 1: Scenario design and development issues N82-13131
Group 2: Real time LOFT operations N82-13132
Results and experience with a small multipurpose tracking simulator N82-13153
A comparison of landing maneuver piloting technique based on measurements made in an airline training simulator and in actual flight N82-13685

TRAJECTORY ANALYSIS
Transitional ballistics of hypervelocity projectiles
[BMVG-FBWT-80-1] N82-13163
Optics of mass separator 1
[DE81-028242] N82-13886

TRANSFER FUNCTIONS
The persistence of a visual dominance effect in a telemanipulator task: A comparison between visual and electrotactile feedback N82-13677
Computer implementation of optimal multivariable controller design in the frequency domain N82-13785

TRANSFORMERS
Evaluation of advanced technologies for power transformers
[DE82-000793] N82-13368

TRANSIENT LOADS
MAGNA: A finite element program for the materially and geometrically nonlinear analysis of three-dimensional structures subjected to static and transient loading
[AD-A099454] N82-13448

TRANSIENT RESPONSE
Transient catalytic combustor model
[NASA-CR-165324] N82-13507

TRANSISTOR CIRCUITS
Charge-based modeling of capacitance in MOS transistors N82-13350

TRANSISTORS
Charge-based modeling of capacitance in MOS transistors N82-13350

TRANSITION FLOW
On a dusty-gas shock tube
[UTIAS-250] N82-13151

TRANSITION TEMPERATURE
Superconductivity of the A15 compound niobium aluminum N82-13932

TRANSMISSION LINES
The 30/20 GHz communications satellite trunking network study
[NASA-CR-165467] N82-13302
Bounding signal levels at terminations of multiconductor transmission line behind an aperture
[AD-A102031] N82-13362

TRANSMISSION LOSS
A statistical analysis of irregular quasi-optical lines (beam guides) with the aid of computer(s) N82-13324

TRANSMITTANCE
Thermal performance of windows having high solar transmittance
[DE81-028872] N82-13524
The effects of atmospheric turbulence on the atmospheric transmittance at optical frequencies N82-13608

TRANSMUTATION
Effect of low-temperature irradiation with (n, alpha) helium production on tensile properties of 12 Cr-1 Mo VW-type steels
[DE81-028578] N82-13222

TRANSONIC FLOW
Transonic flows in an air inlet with large incidence and the effect of a blowing trap N82-13071
Model testing techniques for measuring inlet drag N82-13084
Calculation of wing-body-nacelle interference in subsonic and transonic potential flow N82-13095
Airframe-propulsion system aerodynamic interference predictions at high transonic Mach numbers including off-design engine airflow effects N82-13098
The transonic flow field for a fluidic-generator fuze assembly
[AD-A099616] N82-13388
Prediction of aerodynamic loads on aircrafts with external stores at transonic speeds N82-13813

TRANSPORT AIRCRAFT
Electronic flight deck displays for military transport aircraft N82-13050
Aerodynamics of Power Plant Installation
[AGARD-CP-301] N82-13065
Aerodynamic aspects of a high bypass ratio engine installation on a fuselage afterbody N82-13093
Further tests of a model-based scheme for predicting pilot opinion ratings for large commercial transports N82-13687

TRANSPORT PROPERTIES
Enhanced energy deposition symmetry by hot electron transport
[DE81-028774] N82-13861
Experimental and theorectical studies of excited state transport N82-13967

TRANSPORT THEORY
Transport properties of gaseous ions N82-13870

TRANSPORTATION
Barriers to the utilization of synthetic fuels for transportation
[NASA-CR-165517] N82-13243
Measures of effectiveness of transportation systems management
[PB81-233884] N82-13984

TRANSPORTATION ENERGY
Measures of effectiveness of transportation systems management
[PB81-233884] N82-13984

TRAPEZOIDAL TAIL SURFACES
Pressure distributions on three different cruciform aft-tail control surfaces of a wingless missile at Mach 1.60, 2.36, and 3.70. Volume 1: Trapezoidal tail
[NASA-TM-80097] N82-13110

TRAPPED PARTICLES
Trapped ion research
[AD-A098648] N82-13188

TRAPPING
Study of the physics of insulating films as related to the reliability of metal-oxide semiconductor devices
[AD-A105030] N82-13359
Charge trapping in interface doped MNOS structures N82-13930

TREES (MATHEMATICS)
Trellis data compression N82-13784

TRIAXIAL STRESSES
Effective stress-strain-strength behavior of silicate-grouted sand N82-13257
Elastic-plastic-fracture analysis of concrete structures N82-13462
Plastic flow and unstable deformation of geological materials N82-13587

TROPICAL METEOROLOGY
Annual data and verification tabulation, eastern North Pacific tropical storms and hurricanes 1980
[PB81-230336] N82-13636

TROPICAL STORMS
Some mean characteristics of Central North Pacific tropical cyclones
[PB81-230492] N82-13634

TRUCKS
Weight reduction potential of automobiles and light trucks: 1980 summary source document
[PB81-235756] N82-13987

TUBE HEAT EXCHANGERS
Dish stirling solar receiver combustor test program
[NASA-CR-165017] N82-13495

TURBIDITY
Laboratory measurements of physical, chemical, and optical characteristics of Lake Chicot sediment waters
[NASA-TP-1941] N82-13468

TURBINE BLADES
The effect of rotor blade thickness and surface finish on the performance of a small axial flow turbine
[NASA-TM-82726] N82-13114
Update on Specified European R and D Efforts. Part 1: Appendices
[DE81-026404] N82-13983

TURBINE PUMPS
Study of methods for applying and enhancing transfer film coatings of polytetrafluoroethylene (PTEE) to Space Shuttle Main Engine (SSME) High Pressure Oxygen Turbo Pump (HPOTP) bearings
[NASA-CR-161916] N82-13428

TURBINES
Wind tunnel tests of powered models: A comparison of two methods of simulating the jets of jet engines N82-13087

TURBOCOMPRESSORS
The effect of rotor blade thickness and surface finish on the performance of a small axial flow turbine
[NASA-TM-82726] N82-13114

TURBOFAN ENGINES
Sensor failure detection system --- for the F100 turbofan engine
[NASA-CR-165515] N82-13145

TURBOGENERATORS
Development of advanced rotor-bearing systems for feedwater pumps, phase 2
[DE82-900376] N82-13431

TURBOJET ENGINE CONTROL
Compressor stall inducing installation effects of an engine control parameter for the CF-5 aircraft N82-13085

TURBOMACHINERY
The role and implementation of different nacelle/engine simulation concepts for wind-tunnel testing in research and development work on transport aircraft N82-13086
Computation of unsteady two-dimensional inviscid flow in turbomachinery cascades N82-13401

TURBULENCE
An experimental study of turbulence in an urban environment N82-13618

TURBULENCE EFFECTS
Theoretical analysis of the effects of turbulence on a mobile parametric receiver
[AD-A101418] N82-13833

TURBULENT BOUNDARY LAYER
Calculation of transonic air-intakes using a computer package for inviscid and boundary layer flows N82-13072
Application of the method of weighted residuals to the boundary layer momentum and turbulent stress transport equations N82-13374
Turbulent transfers in the atmospheric surface layer under varied stability conditions. A laboratory study N82-13586

TURBULENT FLOW
An experimental investigation of the turbulent flow in the junction of a flat plate and a body of constant thickness N82-13102
Turbulent wake development behind streamlined bodies N82-13104
An experimental study of Tollmien-Schlichting wave cancellation --- friction drag reduction N82-13120
Mixing of a passive scalar in isotropic and sheared homogeneous turbulence N82-13405

TURBULENT MIXING
Impacts of vertical scale distortion on turbulent mixing in hydraulic models N82-13382
Modeling of turbulent mixing at density discontinuities in nonsteady compressible flows
[AD-A105564] N82-13391

TURBULENT WAKES
Turbulent wake development behind streamlined bodies N82-13104

TWO DIMENSIONAL FLOW
Numerical methods for the analysis of fluid-structure interaction problems N82-13381
Computation of unsteady two-dimensional inviscid flow in turbomachinery cascades N82-13401

TWO PHASE FLOW
Numerical experiments on two-phase liquid-vapor mist transport N82-13402
Hydrodynamic computations of pressures generated by steam pipe rupture
[AD-A102046] N82-13449

TWO REFLECTOR ANTENNAS
Antenna (selected articles)
[AD-B060598] N82-13307
Two-mirror antenna for radio relay communication N82-13308
Use of principle of regularization in direct and mixed problems of the theory of the synthesis of radiating systems N82-13309
Synthesis of a plane system of discrete emitters N82-13310
Open resonators, formed by confocal mirrors with the variable reflection coefficient and the generalized hyper-spheroidal functions N82-13315
Antenna (selected articles)
[AD-B060573] N82-13318
Possibilities of phase correction on the small reflector in a two-reflector antenna N82-13322

U

U.S.S.R.
The development of domestic technology for television transmitting antennas N82-13319

U.S.S.R. SPACE PROGRAM
Plans for Comet Halley --- ESA's Giotto mission, Japan's Planet-A mission, and the U.S.S.R. Venera-Halley mission N82-14024

ULTRASONIC RADIATION
Investigation of the vortex field generated by an airfoil model in a wind tunnel, using ultrasonic pulses
[MPIS-MITT-69] N82-13118
Ultrasonic attenuation and velocity studies in the alpha-alpha' solid solution phases of the Nb-H system
[DE81-026618] N82-13836

ULTRASONIC TESTS
The measurements of fluid shifts and of the tissue compliance along body axis in man
[BMFT-FB-W-80-011] N82-13654

ULTRASONICS
Acoustical speckle interferometry and applications in experimental mechanics N82-13826

ULTRAVIOLET SPECTRA
Ultraviolet structure of supersymmetric non-linear sigma-models N82-13843

ULTRAVIOLET SPECTROMETERS
X-ray and ultraviolet observations of stellar atmospheres N82-14029

ULTRAVIOLET SPECTROSCOPY
Temperature and density of geocoronal helium derived from a rocket-borne He resonance cell experiment
[BMFT-FB-W-80-015] N82-13605
Ultraviolet spectroscopy of comets using sounding rockets, IUE and Spacelab N82-14009

UNDERGROUND EXPLOSIONS
Suppression of coal dust explosion by water barrier in a conveyor belt entry
[PB81-233306] N82-13489
Time domain waveform inversion of short-period p-waves for nuclear explosion source time functions
[AD-A101123] N82-13598

UNDERGROUND STRUCTURES
Soviet UCG experience specifically related to field experiments in the United States
[DE81-028642] N82-13244

UNDERGROUND TRANSMISSION LINES
Review of fire test methods and incident data for portable electric cables in underground coal mines
[PB81-227878] N82-13272

UNDERWATER ACOUSTICS
Acoustical properties of sediments
[AD-A103726] N82-13638
Theoretical analysis of the effects of turbulence on a mobile parametric receiver
[AD-A101418] N82-13833
Mixed layer depth distributions from SVSTD data
[AD-A105669] N82-13834

UNDERWATER PHOTOGRAPHY
Video framerate, resolution and grayscale tradeoffs for undersea telemanipulator N82-13673

UNDERWATER TESTS
Acoustical properties of sediments
[AD-A103726] N82-13638

UNIVAC 1100 SERIES COMPUTERS
Sperry Univac ASCII COBOL level 5R2
[PB81-228892] N82-13748

UNSTEADY FLOW
An acquisition and analysis system for dynamic tests of air inlets N82-13082
A numerical study of laminar unsteady compressible flow over airfoils N82-13099
An initial study of the application of the numerical method of characteristics to unsteady flow analysis in partially filled gravity drainage sized pipes
[PB81-229189] N82-13399
Computation of unsteady two-dimensional inviscid flow in turbomachinery cascades N82-13401

UNSTEADY STATE
Unsteady aeroelastic modeling and trailing-edge flap control of an experimental wing in a two dimensional wind tunnel N82-13122

UPWELLING WATER
Biological and physical oceanographic observations pertaining to the trawl fishery in a region of persistent coastal upwelling
[NASA-TM-81332] N82-13637
The propagation of inertial-internal waves in coastal upwelling regions N82-13645

URBAN PLANNING
The evaluation of technology R&D: A continuing Dilemma
[RAND/P-6655] N82-13980

URBAN RESEARCH
The evaluation of technology R&D: A continuing Dilemma
[RAND/P-6655] N82-13980

URINALYSIS
Application of electrochemistry to biochemical problems --- immunoassay technique using differential pulse anodic stripping voltammetry N82-13179

USER MANUALS (COMPUTER PROGRAMS)
Computer program for optimum nonlinear dynamic design of reinforced concrete slabs under blast loading (CBARCS)
[AD-A104253] N82-13262
MAGNA: A finite element program for the materially and geometrically nonlinear analysis of three-dimensional structures subjected to static and transient loading
[AD-A099454] N82-13448
On the formal specification of computer communication protocols
[AD-A100189] N82-13738
Playbk-routines to drive a digital-to-analog converter
[AD-A102049] N82-13741
Software design and documentation language: User's guide for SDDL release 4
[NASA-CR-165025] N82-13767
User's manuals for DYNA3D and DYNAP: Nonlinear dynamic analysis of solids in three dimensions
[DE81-028360] N82-13772
Mesh generating and plotting facilities of the LAMCAL program
[EUR-7099-EN] N82-13778
Manual for the program CASLE: Cycle analysis and second-life evaluation
[DE81-027487] N82-13971

V

V/STOL AIRCRAFT
Thrust modulation methods for a subsonic V/STOL aircraft
[NASA-TM-82747] N82-13112
A real time Pegasus propulsion system model for VSTOL piloted simulation evaluation
[NASA-TM-82770] N82-13144

VACUUM
New exact and asymptotic solutions of the stationary vacuum Einstein equations N82-13973

VACUUM APPARATUS
Dynamic mass spectrometry: A residual gas analysis method and some applications
[DE81-026230] N82-13195

VACUUM EFFECTS
Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-field
[NASA-TM-82750] N82-13908

VALENCE
Interatomic potential energy hypersurfaces for molecules N82-13841
Effects of pressure on the mixed valent properties of Ce and its intermetallic compounds
[DE81-028572] N82-13953

VAN DER WAAL FORCES
Mechanistic studies of electron exchange kinetics using ab initio
[DE81-026096] N82-13856
Molecular beam electric resonance studies of weakly bound complexes N82-13867

VANADIUM
Upper critical fields and span states in A-15 superconductors, part 1. Vortices in two-dimensional superconductors, part 2 N82-13942

VAPOR DEPOSITION
Advanced indium antimonide monolithic charge coupled infrared imaging arrays
[NASA-CR-165799] N82-13356
The chemical vapor deposition of iridium
[AD-A104582] N82-13360
Design procedures for a commercial scale thermal evaporation system to deposit CdS for solar cell manufacture N82-13551
The physical and electrical properties of polycrystalline-silicon N82-13964

VAPOR PHASES
Surface characterization of dispersed supported metal catalysts using a 'time lapse' dynamic pulse technique N82-13177
Controlled-flash pyrolysis
[DE82-000284] N82-13196
Transient catalytic combustor model
[NASA-CR-165324] N82-13507

VAPORIZING
Properties of matter at ultra-high pressures
[DE81-026504] N82-13190

High-pressure shrouded water sprays for dust control
[PB81-231458] N82-13483

VARIABLE GEOMETRY STRUCTURES
The subsonic performance of practical military variable area convergent nozzles N82-13076

VARIATIONAL PRINCIPLES
A mixed variational principle for finite element analysis N82-13789

VARIATIONS
Optical brightness variations in a sample of nineteen radio-quiet quasi-stellar objects N82-14030

VECTOR ANALYSIS
Simulation studies on the computation of the gravity vector in space from surface data considering the topography of the Earth N82-13612
Solution of single linear tridiagonal systems and vectorization of the ICOG algorithm on the Cray 1 --- laser fusion
[DE81-025461] N82-13773

VECTOR CURRENTS
Spectral functions in quantum chromodynamics and applications N82-13969

VECTORCARDIOGRAPHY
Superconducting magnetometry for cardiovascular studies and an application of adaptive filtering N82-13648

VEGETATION
Development of peatlands in northern Minnesota
[DE82-000873] N82-13475

VEGETATION GROWTH
Ecology and distribution of the Benthic community on the Monterey Breakwater, Monterey, California
[AD-A102047] N82-13555

VELOCITY DISTRIBUTION
An experimental investigation of the flow past a finite circular cylinder at a low subcritical Reynolds number N82-13105
Rayleigh-Taylor stability for a shock wave-density discontinuity interaction
[DE81-028707] N82-13394

VELOCITY MEASUREMENT
Measurement of surface recombination velocity for silicon solar cells using a scanning electron microscope with pulsed beam
[JPL-PUB-81-64] N82-13494

VENTILATION
Control of methane by ventilation of shafts during raise drilling
[PB81-234502] N82-13487

VERBAL COMMUNICATION
Application of computer voice input/output
[DE81-028769] N82-13743

VERTICAL AIR CURRENTS
Numerical study of multicellular natural convection in vertical cavities N82-13403

VERTICAL PERCEPTION
Dynamic measurement of human vertical fusional response N82-13660

VIBRATION
On the vibrational energy transfer processes of polyatomic molecules in the gas and solid phases N82-13865

VIBRATION DAMPING
On the modeling and control of flexible space structures N82-13168
Development of advanced rotor-bearing systems for feedwater pumps, phase 2
[DE82-900376] N82-13431

VIBRATION EFFECTS
Influence of sine, and random, whole-body vibration on visual acuity
[BMVG-FBWT-79-17] N82-13653

VIBRATIONAL SPECTRA
Statistical energy analysis computer program, user's guide
[NASA-CR-161913] N82-13764

VIBRATIONAL STRESS
Assessment of rotor-bearing dynamics: A planning study for the utility industry
[DE82-900378] N82-13430

VIDEO DATA
Digital video bandwidth compression systems employing block truncation coding N82-13290
Video framerate, resolution and grayscale tradeoffs for undersea telemanipulator N82-13673

VINYL COPOLYMERS
Polymers with mesomorphic organization in the side chains from vinyl monomers with mesogenic or potentially mesogenic elements N82-13234
Gas-solid chromatography on cation forms of lightly sulfonated porous polymers N82-13237

VINYL POLYMERS
Crafting of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole onto polymers with aliphatic groups. Synthesis and polymerization of 2 (2-hydroxy-5-isopropenylphenyl) 2H-benzotriazole and a new synthesis of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole
[NASA-CR-165016] N82-13171

VISCOELASTICITY
A nonlinear conservation law with memory --- history boundary value problems in viscoelastic motion
[AD-A103882] N82-13791

VISCOSITY
Experimental determination of the effect of physical properties on the drag of liquid drops N82-13380

VISCOUS FLOW
Computational methods for internal flows with emphasis on turbomachinery
[NASA-TM-82764] N82-13113
Separate numerical treatment of attached and detached flow regions in general viscous flows N82-13375
Technical evaluation report on the Fluid Dynamics Panel Symposium on Computation of Viscous-Inviscid Interactions
[AGARD-AR-171] N82-13384
Underexpanded free jets and their interaction with adjacent surfaces
[LOG-J12276] N82-13385

VISIBILITY
Use of a helmet-mounted matrix display for presenting energy-maneuverability information during simulated close combat N82-13061

VISUAL ACUITY
Influence of sine, and random, whole-body vibration on visual acuity
[BMVG-FBWT-79-17] N82-13653

VISUAL AIDS
Group 1: Scenario design and development issues N82-13131

VISUAL FIELDS
Monocular vision and tactical flight on the helicopter N82-13059

VISUAL OBSERVATION
On observing comets for nuclear rotation N82-14015

VISUAL SIGNALS
Visual/motion cue mismatch in a coordinated roll maneuver
[NASA-CR-166259] N82-13664

VOICE
Application of computer voice input/output
[DE81-028769] N82-13743

VOICE COMMUNICATION
Voice control of the space shuttle video system N82-13719

VOICE DATA PROCESSING
Application of computer voice input/output
[DE81-028769] N82-13743

VOIDS
Application of the theory of linear elastic materials with voids
[DE81-027903] N82-13452

VOLCANOES
The crustal structure of Kilauea and Mauna Loa volcanoes, Hawaii, from seismic refraction and gravity data N82-13583

VOLTAGE CONVERTERS (DC TO DC)
Validation, modeling, and computer assisted design program for power converters --- confirmation of dc/dc converters predicted performance
[ESTEC/DERA-8/7208] N82-13370

VOLTAGE REGULATORS
Distributed photovoltaic systems: Utility interface issues and their present status
[NASA-CR-165019] N82-13492

VORTEX GENERATORS
A device for simulating at a compressor bench an air inlet with large incidence N82-13081

VORTICES
An approximate analytical method for vortex-lift and center of pressure on the slender wing
[NASA-TM-83198] N82-13045
Transmission of sound across a vortex layer enclosing a cylindrical column of jet N82-13838
Upper critical fields and span states in A-15 superconductors, part 1. Vortices in two-dimensional superconductors, part 2 N82-13942

VORTICITY
Separate numerical treatment of attached and detached flow regions in general viscous flows N82-13375

VOYAGER 2 SPACECRAFT
Planetary radio astronomy observations from Voyager-2 near Saturn
[NASA-TM-83856] N82-14037

W

WAKES
Underexpanded free jets and their interaction with adjacent surfaces
[LOG-J12276] N82-13385

WALKING
Pedestrian movement characteristics on building ramps
[PB81-229163] N82-13988

WALL FLOW
Influence of wall roughness, adverse pressure gradient and heat transfer on wall shear stress measurements with Preston tubes
[ILR-50] N82-13396

WARHEADS
On-board data recorder for hard-target weapons
[DE81-028645] N82-13408

WARNING SYSTEMS
Environment simulator for radar signals on the digital level
[FOA-A-30025-E4] N82-13343

WASTE DISPOSAL
Technology assessment of solar energy systems: Availability and impacts of woody biomass utilization in the Pacific Northwest
[DE82-000705] N82-13535
Nitrogen and phosphorus reactions in overland flow of wastewater
[PB81-239311] N82-13574

WASTE ENERGY UTILIZATION
Power-plant fly-ash utilization: A chemical-processing perspective
[DE81-025452] N82-13191
Flow distribution control characteristics in marine gas turbine waste-heat recovery systems. Phase 1: Flow distribution characteristics and control in diffusers
[AD-A104560] N82-13390
Design and development of a reciprocating low-temperature freon expander
[DE81-028609] N82-13392
Residual-energy-applications program environmental analysis report --- industrial scale waste heat recovery equipment and utilization
[DE81-027538] N82-13525
Residual-energy-application program: EAST facility requirements document, volume 1
[DE81-027536] N82-13526
Biomass energy systems: Descriptions and employment requirements for typical operations
[DE82-000236] N82-13538
New and renewable energy in the United States of America
[DE81-030887] N82-13539

WASTE TREATMENT
Treatment of biomass gasification wastewaters using reverse osmosis
[DE82-000698] N82-13566
Treatment of biomass-gasification wastewaters by wet-air oxidation
[DE82-000935] N82-13567

WASTE UTILIZATION
Treatment of biomass gasification wastewaters using reverse osmosis
[DE82-000698] N82-13566
Treatment of biomass-gasification wastewaters by wet-air oxidation
[DE82-000935] N82-13567

WASTES
Benefication with magnetic fluids
[PB81-227126] N82-13485

WATER
Molecular interactions in amphiphilic association structures N82-13206

WATER CONSUMPTION
Five-year Hawaii water research agenda, 1982-1987
[PB81-231912] N82-13478
Water and energy usage in coal preparation
[PB81-238248] N82-13486

WATER DEPTH
ICAPS oceanographic data for the Indian Ocean
[AD-A103173] N82-13641
WATER HEATING
Appliance efficiency and the solar building
[DE81-029073] N82-13265
WATER INJECTION
The occurrence and control of land subsidence due to ground water withdrawal with special reference to the San Joaquin and Santa Clara Valleys, California
N82-13466
WATER MANAGEMENT
Five-year water resources research plan, 1982-1987
[PB81-231938] N82-13479
Massachusetts' five-year water resources research needs, 1982-1987
[PB81-231961] N82-13480
WATER POLLUTION
Transport and reaction of heavy metals in Alaskan fjord estuaries
[DE81-028319] N82-13474
Massachusetts' five-year water resources research needs, 1982-1987
[PB81-231961] N82-13480
Deep Ocean Mining Environmental Study. Environmental effects of commercial-scale mining
[PB81-227753] N82-13484
WATER QUALITY
Five-year Hawaii water research agenda, 1982-1987
[PB81-231912] N82-13478
Nitrogen and phosphorus reactions in overland flow of wastewater
[PB81-239311] N82-13574
WATER RESOURCES
Alaska's Water resources problems and research needs: Institute of Water Resources, five-year research plan
[PB81-231920] N82-13477
Five-year Hawaii water research agenda, 1982-1987
[PB81-231912] N82-13478
Five-year water resources research plan, 1982-1987
[PB81-231938] N82-13479
Massachusetts' five-year water resources research needs, 1982-1987
[PB81-231961] N82-13480
The District of Columbia Five-Year Water Resources Research Program Plan, 1982-1987
[PB81-234882] N82-13482
WATER RUNOFF
Regional hydrologic models for climatology: An application to three Wisconsin watersheds
N82-13467
Analysis of the development of shallow groundwater supplies by pumping from ponds
[PB81-231904] N82-13476
WATER TABLES
Preliminary investigation of a shallow ground-water flow system associated with Connetquot Brook, Long Island, New York
[PB81-228751] N82-13481
WATER TREATMENT
The chemistry of saline water chlorination
N82-13178
Salt removal from brackish water by continuous processes with amphoteric, thermally regenerable ion-exchange resins N82-13202
Concentration of organic compounds in water: A literature survey
[DE81-026517] N82-13556
WATER VAPOR
Effects of hygrothermal conditioning on the dynamic behavior of resin matrix composites N82-13172
An apparatus and procedure for calibrating a water vapor analyzer in the 0.1- to 15-ppm range
[PB81-231185] N82-13413
DMSP water vapor radiances: A preliminary evaluation
[AD-A099305] N82-13625
WATER WAVES
Surface signs of internal ocean dynamics
[AD-A101380] N82-13642
WATERPROOFING
Suppression of coal dust explosion by water barrier in a conveyor belt entry
[PB81-233306] N82-13489
WATERSHEDS
Regional hydrologic models for climatology: An application to three Wisconsin watersheds
N82-13467
WAVE AMPLIFICATION
Energy characteristics of periodic systems of radiators: Efficiency and output coefficient of power, directive gain, and gain factor N82-13306
WAVE ATTENUATION
Three Bureau of Mines optical dust probes
[PB81-231441] N82-13412
WAVE DIFFRACTION
Antenna (selected articles)
[AD-A106476] N82-13294
The use of the Kirchoff method for asymptotic solution of a problem of the diffraction of a plane wave on dielectric bodies of revolution N82-13295
Acoustic boundary wave generation and shadowing at a seamount
[AD-A104594] N82-13832
WAVE DISPERSION
Method of the study of complex waveguide junctions with one or several regions of communication
N82-13316
A statistical analysis of irregular quasi-optical lines (beam guides) with the aid of computer(s)
N82-13324
Pulse propagation in dispersive media with applications to plasmas N82-13897
WAVE EXCITATION
Thin magnetic impedance antennas N82-13314
Energy and momentum deposition to plasmas due to the lower hybrid wave by a finite source
[IPPJ-546] N82-13899
WAVE FRONT DEFORMATION
The influence of pressure waves on measurements of high speed train noise --- high pass filtering of pressure waves
[DFVLR-FB-81-06] N82-13837
WAVE FRONTS
Evaluation of HALO deconvolution schemes
[AD-A105125] N82-13878
WAVE FUNCTIONS
Schwinger's variational principle for electron-ion scattering N82-13844
Compton scattering in a uniform, constant magnetic field N82-13968
WAVE GENERATION
An experimental study of Tollmien-Schlichting wave cancellation --- friction drag reduction N82-13120
WAVE PACKETS
Pulse propagation in dispersive media with applications to plasmas N82-13897
WAVE PROPAGATION
Antenna (selected articles)
[AD-A106476] N82-13294
The use of the Kirchoff method for asymptotic solution of a problem of the diffraction of a plane wave on dielectric bodies of revolution N82-13295
Millimeter wave alternate route study
[AD-A102303] N82-13339
The relationship between the acoustic impedance and unsteady flow field near the orifice of a two dimensional Helmholtz resonator in grazing flow
N82-13378
Large amplitude compression and shear wave propagation in impact-loaded PMMA
[AD-A105953] N82-13450
Surface waves in strong ground motion with application to offshore environments N82-13584
The effects of atmospheric turbulence on the atmospheric transmittance at optical frequencies
N82-13608
Surface signs of internal ocean dynamics
[AD-A101380] N82-13642
The propagation of inertial-internal waves in coastal upwelling regions N82-13645
Theoretical analysis of the effects of turbulence on a mobile parametric receiver
[AD-A101418] N82-13833
Beam propagation in the frequency-converted subsystems of Nova and Novette
[DE81-028253] N82-13862
WAVE RESISTANCE
Optimum Design of Static, Earthquake, and Wind Steel Structures (ODSEWS-2D)
[PB81-232738] N82-13271
WAVE SCATTERING
Energy characteristics of periodic systems of radiators: Efficiency and output coefficient of power, directive gain, and gain factor N82-13306
Method of the study of complex waveguide junctions with one or several regions of communication
N82-13316
WAVEFORMS
Time domain waveform inversion of short-period p-waves for nuclear explosion source time functions
[AD-A101123] N82-13598
WAVEGUIDE ANTENNAS
Method of the study of complex waveguide junctions with one or several regions of communication
N82-13316
Experimental and theoretical investigations with laboratory models of phased array antenna
[BMVG-FBWT-79-21] N82-13341
WAVEGUIDE LASERS
Long-term operation of a sealed waveguide CO sub 2 laser
[AD-A105261] N82-13420
WAVEGUIDES
Antenna (selected articles)
[AD-A106476] N82-13294
Cophased directed surface wave splitters using dielectric waveguides N82-13296
Directed dividers on the metal-dielectric waveguides N82-13326
WAVELENGTH DIVISION MULTIPLEXING
Time dependent recording of images transmitted over optical fibers
[DE81-026599] N82-13889
WEAK ENERGY INTERACTIONS
Adaptation of the TH Epsilon Mu formalism for the analysis of the equivalence principle in the presence of the weak and electroweak interaction
[NASA-TM-82450] N82-13851
WEAK INTERACTIONS (FIELD THEORY)
Relativistic many-body perturbation theory of parity-violation in atoms N82-13845
Long-range interactions in lattice field theory
N82-13941
WEAPON SYSTEMS
Performance of chemical analogs of the explosive CP
[DE81-025836] N82-13251
WEAR
Examination of early wear detection in diesel engines by energy dispersive radioisotope X ray fluorescence analysis
[BMVG-FBWT-79-19] N82-13432
WEAR TESTS
Wear properties of electrodeposited titanium diboride coatings
[PB81-233314] N82-13199
WEATHER FORECASTING
Forecasting skill --- weather forecasting
[AD-A099778] N82-13626
WEATHER MODIFICATION
The Sierra Cooperative Pilot Project: Precipitation management research in the Sierra Nevada
[PB81-234452] N82-13630
WEATHERING
Practical aspects of instrumentation system installation, volume 13
[NASA-TM-84067] N82-13140
Rates and mechanisms of chemical weathering in an organic environment at Panolo Mountain, Georgia
N82-13615
WEIBULL DENSITY FUNCTIONS
Confidence intervals for the reliability of a future system configuration
[AD-A105031] N82-13814
WEIGHTING FUNCTIONS
Weighting of aptitude components based on differences in technical school difficulty
[AD-A102045] N82-13725
WEIGHTLESSNESS
A preliminary analysis of the data from experiment 77-13 and final report on glass fining experiments in zero gravity
[NASA-CR-161884] N82-13154
WELDED JOINTS
Residual stress and deformation in circumferential pipe-joint welds
[PB81-232464] N82-13458

WELDED STRUCTURES
Substructure of 316 stainless steel pipe weldments --- liquid metal fast breeder reactor materials N82-13215

WELDING
Behavior of plane panels in ship structures with local initial deflections
[BMVG-FBWT-80-18] N82-13455

WEST COMET
Narrow passband imagery of comets --- Comet West N82-14014

WEST VIRGINIA
Pyrolytic characterization of the organic matter in selected coals and in the Devonian shales of southern West Virginia N82-13578

WHEEL BRAKES
The influence of high temperature on braking --- wheel brakes N82-13433

WIND DIRECTION
Atmospheric dispersion forecasts at selected locations in the United States
[PB81-230443] N82-13635

WIND MEASUREMENT
Biological and physical oceanographic observations pertaining to the trawl fishery in a region of persistent coastal upwelling
[NASA-TM-81332] N82-13637

WIND PROFILES
Network wind power over the Pacific northwest. Appendix 1: Wind statistics summaries for the wind power data stations
[DE81-029291] N82-13518

WIND SHEAR
Feasibility study of a procedure to detect and warn of low level wind shear
[NASA-CR-3480] N82-13621

WIND TUNNEL MODELS
Wind tunnel test and analysis techniques using powered simulators for civil nacelle installation drag assessment N82-13088
Establishment of an experimental technique to provide accurate measurement of the installed drag of close coupled civil nacelle/airframe configurations, using a full span model with turbine powered engine simulators N82-13089
Pressure distributions on three different cruciform aft-tail control surfaces of a wingless missile at Mach 1.60, 2.36, and 3.70. Volume 1: Trapezoidal tail
[NASA-TM-80097] N82-13110
Thrust modulation methods for a subsonic V/STOL aircraft
[NASA-TM-82747] N82-13112

WIND TUNNEL TESTS
Performance of highly integrated inlets for supersonic aircraft N82-13066
A device for simulating at a compressor bench an air inlet with large incidence N82-13081
Wind tunnel tests of powered models: A comparison of two methods of simulating the jets of jet engines N82-13087
Wind tunnel test and analysis techniques using powered simulators for civil nacelle installation drag assessment N82-13088
Studies of air inlets at Reynolds numbers comparable to flight in ONERA's F1 and S1MA wind tunnels N82-13091
The influence of closed-coupled, rear fuselage mounted nacelles on the design of an advanced high speed wing N82-13092
Some observations of surface pressures and the near wake of a blunt trailing edge airfoil N82-13100
Wind-tunnel investigation of the effects of blade tip geometry on the interaction of torsional loads and performance for an articulated helicopter rotor
[NASA-TP-1926] N82-13107
Crossflow effects on steady and fluctuating pressures on an ogive-cylinder cone-frustum model in supersonic separated flow
[NASA-TP-1951] N82-13108
Pressure distributions on three different cruciform aft-tail control surfaces of a wingless missile at Mach 1.60, 2.36, and 3.70. Volume 1: Trapezoidal tail
[NASA-TM-80097] N82-13110
Force measurements on a reflex cambered delta wing
[LOG-C4073] N82-13111
Final report on the FueFo-4 major theme: Interference drag with airframe/engine integration on fighter aircraft
[BMVG-FBWT-79-20] N82-13116
Investigation of the vortex field generated by an airfoil model in a wind tunnel, using ultrasonic pulses
[MPIS-MITT-69] N82-13118
An analytical and experimental study of the steady and unsteady airloads on a wing with oscillating control including a streamlined gap --- wind tunnel test
[DFVLR-FB-81-18] N82-13119
Unsteady aeroelastic modeling and trailing-edge flap control of an experimental wing in a two dimensional wind tunnel N82-13122
The transonic flow field for a fluidic-generator fuze assembly
[AD-A099616] N82-13388

WIND VELOCITY
Network wind power over the Pacific northwest. Appendix 1: Wind statistics summaries for the wind power data stations
[DE81-029291] N82-13518
Numerical wind-speed simulation model
[DE82-000956] N82-13627

WIND VELOCITY MEASUREMENT
Compensation for use of monthly-averaged winds in numerical modeling
[NASA-TM-83855] N82-13623

WINDOWS (APERTURES)
Thermal performance of windows having high solar transmittance
[DE81-028872] N82-13524

WINDPOWER UTILIZATION
Spectra over complex terrain
[DE81-028734] N82-13473
Network wind power over the Pacific northwest. Appendix 1: Wind statistics summaries for the wind power data stations
[DE81-029291] N82-13518
Wind Power: Research on network wind power over the Pacific northwest. Executive summary
[DE81-029360] N82-13519
Application of Bayesian analysis for wind energy site evaluation N82-13619
Numerical wind-speed simulation model
[DE82-000956] N82-13627

WING FLAPS
Unsteady aeroelastic modeling and trailing-edge flap control of an experimental wing in a two dimensional wind tunnel N82-13122

WING LOADING
An analytical and experimental study of the steady and unsteady airloads on a wing with oscillating control including a streamlined gap --- wind tunnel test
[DFVLR-FB-81-18] N82-13119

WING NACELLE CONFIGURATIONS
Establishment of an experimental technique to provide accurate measurement of the installed drag of close coupled civil nacelle/airframe configurations, using a full span model with turbine powered engine simulators N82-13089
Evaluation of an experimental technique to investigate the effects of the engine position on engine/pylon/wing interference N82-13090
A numerical method for studying nacelle-jet-airfoil interaction in inviscid three-dimensional flow N82-13094
Aerodynamics of an airfoil with a jet issuing from its surface N82-13121

WING PROFILES
Refinement of a method for determining the induced and profile drag of a finite wing from detailed wake measurements N82-13103

WING TIP VORTICES
Refinement of a method for determining the induced and profile drag of a finite wing from detailed wake measurements N82-13103
Investigation of the vortex field generated by an airfoil model in a wind tunnel, using ultrasonic pulses
[MPIS-MITT-69] N82-13118

WINGS
Calculation of wing-body-nacelle interference in subsonic and transonic potential flow N82-13095
Aerodynamics of an airfoil with a jet issuing from its surface N82-13121
Prediction of aerodynamic loads on aircrafts with external stores at transonic speeds N82-13813

WISCONSIN
Regional hydrologic models for climatology: An application to three Wisconsin watersheds N82-13467

WOOD
High altitude testing of residential wood-fired combustion equipment
[PB81-226151] N82-13575

WORKLOADS (PSYCHOPHYSIOLOGY)
Evaluation of a pilot workload assessment device to test alternate display formats and control handling qualities N82-13062
Proceedings of the Seventeenth Annual Conference on Manual Control
[NASA-CR-165005] N82-13665
Pupillometric measurement of operator workload N82-13666
Subjective rating scales as a workload N82-13669
Physiological assessment of operator workload during manual tracking. 1: Pupillary responses N82-13670
Further tests of a model-based scheme for predicting pilot opinion ratings for large commercial transports N82-13687
Load compensating reactions to perturbations at wrist joint in normal man N82-13708

WRIST
Load compensating reactions to perturbations at wrist joint in normal man N82-13708

X

X RAY ANALYSIS
Examination of early wear detection in diesel engines by energy dispersive radioisotope X ray fluorescence analysis
[BMVG-FBWT-79-19] N82-13432
Proton-induced X-ray emission analysis: A complement to analytical methods used in environmental studies
[DE81-029012] N82-13557
Algorithms for imaging myocardial blood flow using X-ray computed tomography N82-13661
Defect structure and properties of intermetallic compound beta-LiAl N82-13959

X RAY ASTRONOMY
Concept and feasibility study (phase A) for the X-ray satellite ROBISAT. Executive summary
[BMFT-FB-W-80-027] N82-13164

X RAY DIFFRACTION
Computer programs for line shape analysis of X-ray diffraction peaks --- thin film analysis
[PB81-227787] N82-13958

X RAY FLUORESCENCE
Proton-induced X-ray emission analysis: A complement to analytical methods used in environmental studies
[DE81-029012] N82-13557

X RAY SOURCES
Transition radiation as an X-ray source N82-13840

X RAY SPECTROSCOPY
Low energy X-ray spectrometer
[DE81-025824] N82-13407
Spectrometric properties of crystals for low-energy X-ray diagnostics
[DE81-028763] N82-13954

X RAY TELESCOPES
X-ray and ultraviolet observations of stellar atmospheres N82-14029

XENON
A study of the formation and structure of small clusters of noble gases and sulfur hexafluoride formed in Laval Nozzle molecular beams N82-13201
Theoretical equations of state for metals
[DE81-028743] N82-13224
Coexistence of non-registered monolayer and bilayer solid films N82-13931

Z

ZENER EFFECT
Laser induced charge transfer collisions N82-13418

ZETA PINCH
Numerical solutions of the EBT Radial eigenmode problem N82-13916

ZINC
Insoluble anodes for electrowinning zinc and other metals
[PB81-227365] N82-13227

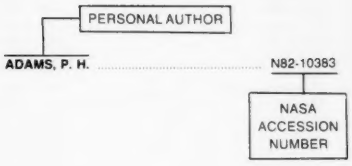
The trace metal stratigraphy and recent sedimentary history of anthrogenous particulates on the San Pedro Shelf, California N82-13579

ZIRCONIUM TITANATES

Minimum/constant voltage PLZT electrooptic shutters --- lead lanthanum zirconate titanate wafers for flash protective goggles
[DE81-028646] N82-13888

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

ABDUL-AHAD, R. B. N82-13461
ABE, H. N82-13899
ABE, Y. N82-13905
ABRAMSOHN, D. A. N82-13934
ACREE, W. E., JR. N82-13205
ADAM, E. C. N82-13064
ADAMS, M. L., JR. N82-13431
ADAMS, W. C. N82-13339
ADRION, W. R. N82-13744
AGARWAL, G. C. N82-13698
AGARWELL, G. C. N82-13708
AHEARN, M. F. N82-13996
N82-13997
N82-14008
AHMAKJIAN, M. N82-13883
AIMAN, W. R. N82-13543
AIMIN, D. B. N82-13332
AITKEN, J. M. N82-13359
AKHTER, M. M. N82-13145
AKSNES, K. N82-13603
AL-FEDAGHI, S. S. N82-13730
AL-KHATTAT, I. M. N82-13445
AL-MANDIL, M. Y. N82-13286
ALBRECHT, R. N82-14018
ALBRECHT, W. N82-13432
ALEXANDER, J. K. N82-14037
ALEXEFF, I. N82-13914
ALGUARD, M. J. N82-13818
ALIPHAS, A. N82-13354
ALLEGRE, J. N82-13385
ALLEN, F. N82-13165
ALLEN, J. R. N82-13551
ALLEN, R. W. N82-13684
N82-13716
N82-13717
N82-13718
ALLWINE, K. J. N82-13535
ALSMILLER, F. S. N82-13873
ALSMILLER, R. G., JR. N82-13873
ALTMAN, R. L. N82-13186
ALVAREZ, G. L. N82-13843
AMANO, T. N82-13900
ANCHETTA, J. N82-13711
ANCTIL, J. C. N82-13421
ANDERSON, D. H. N82-13882
ANDERSON, D. N. N82-13509
ANDERSON, J. A. N82-13569
ANDERSON, J. V. N82-13264
ANDERSON, R. A. N82-13422
N82-13423
ANDERSON, R. J. N82-13193
ANDERSON, V. E. N82-13860
ANGWIN, M. J. N82-13510
ANTON, D. L. N82-13212
APELIAN, D. N82-13260
APKARIAN, V. A. N82-13865
ARAL, M. M. N82-13476
ARAVAMUDHAN, M. D. N82-13111
ARBAK, C. N82-13720
ARENA, L. N82-13656
ARJOMANDI, E. N82-13742
ARNON, D. S. N82-13763
ASAY, J. R. N82-13190
ASHARE, E. N82-13541
ASHER, N. J. N82-13136
ASHLEY, J. C. N82-13860
ASKA, D. Y. N82-13644
ATHEY, G. F. N82-13627
ATTIA, M. N82-13892
ATTLFELLNER, S. N82-13137
AU, P. N82-13285
AUBIER, M. N82-14037
AUSTIN, T. A. N82-13479
AVERY, D. E. N82-13383
AYZENBERG, A. L. N82-13322

B

BABB, C. D. N82-13110
BACK, L. H. N82-13495
BACK, R. J. R. N82-13799
BADAVI, F. N82-13828
N82-13829
N82-13830
BADER, T. A. A. N82-13287
BAES, C. F., JR. N82-13558
BAHNASSY, H. M. N82-13355
BAJAJ, J. N82-13938
BAKER, P. C. N82-13225
BAKER, R. W. N82-13518
N82-13519
BAKHRAKH, L. D. N82-13313
BAKHRAS, L. D. N82-13309
BALASUBRAMANYAN, C. N82-13813
BALESTRINI, S. J. N82-13886
BALKE, H. N82-13138
BALL, N. B. N82-13609
BALLARD, W. P. N82-13353
BALLINGER, M. Y. N82-13627
BANKSTON, C. P. N82-13495
BARAKAT, R. N82-13878
BARBATO, G. J. N82-13063
BARISH, J. N82-13873
BARKEBY, G. N82-13604
BARKER, E. S. N82-14010
BARLOW, J. L. N82-13758
BARNETT, R. M. N82-13493
BARNIV, Y. N82-13755
BARON, J. L. N82-13512
BARON, S. N82-13700
BARRETT, J. H. N82-13818
BARRUS, D. M. N82-13954
BARTCHI, B. N82-13883
BARTEAU, M. A. N82-13233
BARTHEL, G. N82-13164
BARTON, M. A. N82-13816
BARUCH, F. N82-13817
BASKAKOV, V. V. N82-13296
BAUMANN, G. N82-13411
BAUMGART, S. N82-13890
BAUMGARTNER, C. E. N82-13208
BAXI, C. B. N82-13771
BAXTER, V. D. N82-13523
BEACH, B. E. N82-13127
BEATTIE, E. C. N82-13145
BEATTY, J. N82-13666
N82-13670
BEAUCHAMP, R. B. N82-13386
BECHER, J. N82-13828
N82-13829
N82-13830
BECHERT, D. N82-13837
BECHTELER, M. N82-13957
BECKLIN, E. E. N82-14043
BECLE, J. P. N82-13087
BEDAIR, S. M. N82-13540
BEEZHOLD, W. N82-13365
BEHANNON, K. W. N82-13593
N82-13594
BEHEIM, M. A. N82-13146
BEJCZY, A. K. N82-13707
N82-13719
BELL, S. E. N82-13538
BENDIKSEN, B. N82-13206
BENLTAYF, M. A. N82-13257
BENNETT, B. G. N82-13179
BENSON, B. B. N82-13189
BENTLEY, J. N82-13855
BERG, R. F. N82-13705
BERGSTRALH, J. T. N82-14021
BERGSTROM, R. W. N82-13622
BERK, H. L. N82-13915
N82-13916
N82-13921
BERKOWITZ, D. A. N82-13866
BERMAN, B. L. N82-13818
BERMAN, P. N82-13491
BERNAL, L. N82-13386
BERTIN, J. J. N82-13388
BERTOLONE, G. N82-13073
BEST, J. F. N82-13689
BEYER, B. J. N82-13610
BEYER, R. N82-13060
BEYERLE, A. G., JR. N82-13847
BHAGAVATULA, V. A. N82-13881
BIELE, J. K. N82-13163
BIGELEISEN, J. N82-13152
BIGHEL, L. N82-13913
BIGLEY, W. J. N82-13715
BILLINGS, W. W. N82-13357
BINGHAM, C. E. N82-13264
BIRD, K. L. N82-13669
BIRKS, N. N82-13217
BIRNBAUM, H. K. N82-13836
BISSINGER, N. C. N82-13074
BJOERKSTROEM, A. N82-13643
BLACHMAN, S. N82-13527
BLAKE, J. B. N82-13600
BLAKE, M. L. N82-13898
BLAKE, R. L. N82-13954
BLOIS, M. C. N82-13655
BLOOM, S. D. N82-13818
BLUMENTHAL, D. L. N82-13563
N82-13564
N82-13568
N82-13569
N82-13570
BOBELDIJK, C. N82-13927
BOESCHE, D. N82-13253
N82-13432
BOGOSLOVSKIY, G. S. N82-13325
BOGUE, J. L. N82-13971
BOKUN, S. G. N82-13266
BOORN, A. W. N82-13209
BOOZER, A. H. N82-13924
BOREK, R. W. N82-13140
BORG, R. N82-13083
BORSTING, J. R. N82-13976
BORSUK, J. A. N82-13929
BOULDIN, D. W. N82-13516
BOUSQUET, J. N82-13094
BOWE, T. R. N82-13658
BOWERS, D. L. N82-13075
BOYLE, R. J. N82-14035
BOZORG-GRAYELI, N. N82-13211
BOZZI, P. J. N82-13689
BRAATEN, E. A. N82-13842

BRADLEY, B. D. N82-13979
BRADSHAW, J. A. N82-13831
BRANDT, J. C. N82-13989
N82-14003
N82-14013
BRANSTAD, M. A. N82-13744
BRAR, G. S. N82-13288
BRAUN, E. N82-13272
BRAUSER, K. N82-13702
BREAKER, L. N82-13637
BREDIF, M. N82-13398
BREUL, H. T. N82-13672
BRILEY, R. P. N82-13172
BROCKMAN, R. A. N82-13448
BRODSKY, S. J. N82-13858
BROENKOW, W. W. N82-13637
BROOKS, J. N82-13976
BROOKS, R. A. N82-13761
BROWN, C. H., JR. N82-13560
BROWN, G. L. N82-13827
BROWN, I. F. N82-13611
BROWN, J. W. N82-13719
BROWN, N. J. N82-13225
BROWN, R. A. N82-13270
BROWN, T. W. N82-13070
BRUNNER, W. N82-13164
BUDAIR, M. U. N82-13105
BULZAN, D. L. N82-13504
BURCZYK, L. N82-13424
BUREK, A. J. N82-13954
BURHOP, C. J. N82-13771
BURKE, H. H. K. N82-13470
BURKE, K. A. N82-13508
BURLAGA, L. F. N82-13593
N82-13594
BURNET, G. N82-13191
BURNS, J. E. N82-13760
BURRELL, D. C. N82-13474
BUSCH, C. F. N82-13270
BUSCH, S. J. N82-13555
BUTAKOVA, S. V. N82-13316

C

CAGLAYAN, A. K. N82-13700
CALDWELL, W. N82-13633
CALISE, J. N82-13359
CALLOWAY, R. L. N82-13106
CAMPBELL, A. K. N82-13632
CAMPBELL, J. R. N82-13835
CAMPINS, H. N82-14001
CAREY, D. E. N82-13269
CARLBERG, J. R. N82-13741
CARLING, R. W. N82-13530
CARLSON, G. H. N82-13454
CARLSSON, H. N82-13798
CARTER, E. C. N82-13088
CARTER, W. E. N82-13606
CASHDOLLAR, K. L. N82-13412
CAVANAGH, D. N82-13126
N82-13132
CHAFIN, R. L. N82-13722
CHAMBERS, D. M. N82-13527
CHAN, L. K. N82-13246
CHANG, E. S. H. N82-13782
CHANG, R. L. S. N82-13510
CHANG, T. P. N82-13728
CHANG, W. S. N82-13400
CHAO, S. L. N82-13377
CHAREST, J. A. N82-13454
CHATOORGOON, V. N82-13850
CHE, S. C. N82-13196
CHELYSHEV, V. D. N82-13317
CHEN, C. B. N82-13196
CHEN, G. T. N82-13198
CHEN, T. N82-13848
CHENG, C. Z. N82-13917
N82-13918
CHENG, F. Y. N82-13271
CHENG, L. J. N82-13494
CHENG, P. E. N82-13794
CHHABRA, K. L. N82-13796
CHIANG, S. H. N82-13486
CHO, T. N82-13901
CHOCKIE, A. D. N82-13535
CHOI, H. J. N82-13213
CHOJNACKI, J. N82-13139
CHORLEY, R. A. N82-13050
CHOU, C. P. J. N82-13729
CHRISTOPHOROU, L. G. N82-13194
N82-13516
N82-13952
CHU, A. N. N82-13840
CHU, E. K. N82-13270
N82-13510
CHU, T. K. N82-13924
CHURCH, K. W. N82-13797
CHURCHILL, T. N82-13724
CLARK, D. R. N82-13467
CLARK, H. E. N82-13414
CLARK, J. A. N82-13174
CLARK, J. S. N82-13509
CLARKE, J. F. N82-13618
CLARKE, M. M. N82-13678
N82-13679
CLELAND, J. G. N82-13576
CLEMENT, W. F. N82-13716
CLIQUE, M. N82-13370
COBB, W. E. N82-13572
COCHRAN, A. L. N82-14010
COE, C. F. N82-13108
COFFEY, H. E. N82-14044
N82-14045
COHEN, M. D. N82-13258
COHEN, R. H. N82-13920
COLBOURNE, D. E. N82-13069
COLE, E. R., JR. N82-13227
COLLINS, B. N82-13988
CONNOLLY, J. M. N82-13264
CONTI, R. S. N82-13412
COOK, C. W. N82-13682
COOK, M. N82-13684
COOLEY, D. S. N82-13632
COOPER, C. J. M. N82-13939
COPELAND, E. L. N82-13680
COPPENS, P. N82-13152
CORKER, K. N82-13676
COSTER, J. R. N82-13056
COSTON, J. E. N82-13216
COWIN, S. C. N82-13452
COX, M. F. N82-13180
CREEKMORE, R. N82-13144
CREEL, L. N82-13774
CRISCUOLO, A. L. N82-13521
CROSS, W. N82-13483
CRUICKSHANK, J. N82-13420
CULBERTSON, C. R. N82-13833
CUNNINGHAM, R. N82-13768
CYRUS, J. D. N82-13888

D

DAINI, O. O. A. N82-13731
DALDER, E. N. C. N82-13429
DANESHYAR, H. N82-13434
DANIELSON, M. J. N82-13409
DANNEBERG, E. N82-13060
DAS, B. P. N82-13845
DASARO, J. A. N82-13053
DASGUPTA, A. K. N82-13181
DATZ, S. N82-13818
DAUD, T. N82-13494
DAVIS, D. W., JR. N82-13374
DAVIS, W. A. N82-13362
DAY, M. L. N82-13789
DEAN, A. M., JR. N82-13597
DEANGELIS, D. G. N82-13575
DEANGELIS, W. J. N82-13824
DECARIA, A. J. N82-13577
DECORTE, K. N. N82-13549
DEGEWIJ, J. N82-13998
DEGROOT, M. H. N82-13815
DEKEERSMAECKER, R. F. N82-13359
DEKEL, E. N82-13820
DELAHAYE, B. N82-13081
N82-13082
DELEON, P. N82-13980
DELEON, R. L. N82-13867
DELSEMME, A. H. N82-13990
N82-14004
DEMEYER, K. N82-13359
DEMLER, R. L. N82-13392
DESAULNIERS, D. L. N82-13156
DESCH, M. D. N82-14037
N82-14038
DEUL, M. N82-13488
DEVROOMEN, A. R. N82-13950
DEYOUNG, R. J. N82-13415
DIBONA, P. J. N82-13361
DICKINSON, J. E. N82-13561
DIGUMARTHI, R. V. N82-13100
DILLARD, D. A. N82-13173
DIMARIA, D. J. N82-13359
DOBROVOLSKIY, I. F. N82-13331
DOBROVOLSKY, O. V. N82-13994
DODS, J. B., JR. N82-13108
DOENECKE, J. N82-13164
DOMAS, P. A. N82-13214
DOMINGUEZ, R. R. N82-13921
DONALDSON, R. J., JR. N82-13335
DONCHIN, E. N82-13667
DONELSON, J. N82-13834
DONN, B. N82-13989
N82-14005
N82-14022
DONOVAN, T. M. N82-13197
DORRIS, J. F. N82-13587
DOTSON, R. S. N82-13719
DOUGAL, M. D. N82-13479
DOUGLAS, L. L. N82-13136
DOUGLAS, R. E. N82-13486
DOVIAK, R. J. N82-13628
DRAXLER, R. R. N82-13635
DREIFUERST, G. R. N82-13348
DROBNIS, D. N82-13978
DUBOFSKY, D. F. N82-13632
DUBORD, M. N82-13671
DUBROVIN, V. F. N82-13296
N82-13326
DUCAS, W. N82-13549
DUFRANE, K. F. N82-13428
DUKOWICZ, J. K. N82-13393
DUNCAN, A. A. N82-13249
DUNCAN, C. S. N82-13497
DURAI-SWAMY, K. N82-13196
DUROSS, H. N82-13703
DYMENT, A. N82-13071

E

EARLES, J. A. N82-13725
EATOUGH, D. J. N82-13557
EATOUGH, N. L. N82-13557
EDEN, A. N82-13528
EDWARDS, P. L. N82-14030
EDWARDS, P. R. N82-13275
N82-13283
EHSANI, M. N82-13349
EICHHORN, E. N82-13164
EIMERL, D. N82-13862
EL-REFAEE, M. M. N82-13099
ELIASON, S. D. N82-13566
ELLIOTT, C. T. N82-13053
ELLIOTT, J. F. N82-13527
ELLIS, S. R. N82-13710
ELSENAAR, A. N82-13090
EMBURY, J. F. N82-13882
EMERY, J. H. N82-13049
ENDERLE, H. N82-13077
ENEVOLDSON, E. K. N82-13148
ENGLER, R. H. N82-13118
ENGLISH, C. J. N82-13567
ENKE, C. G. N82-13736
ENSLOW, P. H., JR. N82-13739
ERICKSON, J. L. N82-13352
EVANS, D. R. N82-13868
N82-14037
EVANS, T. O. N82-13637
EWALD, B. N82-13086

F

FANG, R. C. N82-13289
FARRELL, J. J. N82-13533
FECHTIG, H. N82-13993
FEDDERSEN, R. N82-13777
FELDER, W. N82-13192
FELDMAN, P. D. N82-14009
FELDMAN, R. D. N82-13944
FELTHAUSER, H. N82-13954
FENIMORE, E. E. N82-13954
FENNELL, J. F. N82-13600
FENNELL, K. F. N82-13601
FENNELLY, A. J. N82-13851
FERRANTE, F. M. N82-13733
FERRITTO, J. M. N82-13262

FICHTBAUER, S. N82-13153
FIENBERG, S. E. N82-13815
FISCHER, M. J. N82-13742
FISH, J. D. N82-13530
FLEMING, W. N82-13251
FLINN, D. R. N82-13199
FLITCROFT, J. E. N82-13069
FLODROPS, J. P. N82-13071
FORD, W. N82-13743
FORNASIER, L. N82-13073
FORREST, L. N82-13985
FOSSARD, A. J. N82-13370
FOULDS, J. R. N82-13215
FOUSHEE, H. C. N82-13123
FRALEY, G. S. N82-13394
FRANKEL, M. J. N82-13361
FREEDY, A. N82-13683
FRICKEL, R. H. N82-13882
FRIEDMAN, L. N82-14026
FRINK, A. N82-13133
FRONABARGER, J. W. N82-13250
N82-13251
FROST, W. N82-13621
FUKUMASA, O. N82-13906
FULFORD, J. M. N82-13476
FULLER, H. H. N82-13392

G

GABRIEL, T. A. N82-13873
GADDY, J. L. N82-13542
GAILLARD, J. P. N82-13677
GARIN, J. N82-13678
N82-13679
GARTLING, D. K. N82-13775
GATLEY, I. N82-14043
GAYDOSH, R. J. N82-13237
GEHEEB, N. N82-13432
GEISSLER, W. N82-13119
GENNERY, D. N82-13768
GEORGE, A. H. N82-13406
GEORGE, E. I. N82-13812
GEORGE, F. L. N82-13691
GEPPERT, S. N82-13506
GERHARD, W. N82-13546
GERMAN, K. E. N82-13626
GIBBON, C. F. N82-13356
GIBBS, R. J. N82-13517
GIBLER, C. D. N82-13657
GIBSON, D. B. N82-13637
GICLAS, H. L. N82-14016
GIESE, R. H. N82-13999
GIFFIN, W. C. N82-13662
N82-13663
GIFFORD, D. K. N82-13732
GIGUERE, P. T. N82-13991
GILBERT, B. R. N82-13256
GILL, R. N82-13667
GILLASPY, P. H. N82-13380
GINLEY, D. S. N82-13956
GIRMAN, J. R. N82-13561
GLAD, A. N82-13978
GLADD, N. T. N82-13919
GLASS, I. I. N82-13151
GLIDEWELL, R. J. N82-13078
GLIDEWELL, S. R. N82-13807
GLOVER, K. M. N82-13335
GLUSHKOVSKIY, E. A. N82-13314
GNANAMUTHU, D. S. N82-13219
GOCHANOUR, C. R. N82-13967
GODFREY, P. J. N82-13480
GODLEY, V. M. N82-13599
GOKA, T. N82-13690
GOLDBECK, R. A. N82-13733
GOLDSMITH, E. L. N82-13070
GOLDSTEIN, E. L. N82-13480
GOLDSTEIN, S. A. N82-13852
GOLOVACHEV, V. M. N82-13305
GOODARZI, S. M. N82-13698
GOODYEAR, R. L. N82-13388
GOTTLIEB, G. L. N82-13698
N82-13708
GRABE, W. N82-13085
GRADIE, J. N82-14001
GRANT, P. R., JR. N82-13520
GRANT, W. B. N82-13157
GRAY, T. E. N82-13360
GREEN, C. N82-13770
GREEN, R. N. N82-13620
GREENBERG, J. M. N82-13989
GREENWALD, A. C. N82-13947
GREER, E. D. N82-13291
GREETHAM, D. E. N82-13364
GREGG, D. W. N82-13543
GRIEB, H. N82-13077
GRIMM, U. N82-13193
GROOT, R. A. N82-13950
GROSS, J. P. N82-13135
GROSSBECK, M. L. N82-13222
GROVER, R. L. N82-13459
GRUN, E. N82-13993
GRUNNET, J. L. N82-13084
GRUNWALD, A. J. N82-13674
GRUPE, U. N82-13777
GRYSON, P. N82-13071
GUEST, G. E. N82-13910
GULCAT, U. N82-13375
GULL, T. R. N82-14012
N82-14014
GUNTHER, E. B. N82-13636
GUPTA, Y. M. N82-13450
GURGANUS, E. A. N82-13468
GUSTAFSSON, U. R. C. N82-13554
GUZEYEV, I. V. N82-13306

H

HAAG, W. R. N82-13178
HAAS, J. E. N82-13114
HABERLAND, C. N82-13396
HALL, G. D. N82-13884
HALL, J. C. N82-13440
HALLQUIST, J. O. N82-13772
HAMADA, Y. N82-13901
N82-13905
HAMAMATSU, K. N82-13903
HAMASAKI, S. N82-13919
HAMED, M. A. N82-13826
HAMER, E. N82-13546
HAMILTON, D. C. N82-13818
HANDLYKKEN, M. N82-13707
HANK, R. N82-13397
HANNAFORD, B. N82-13711
HANSEN, L. D. N82-13557
HARDY, R. J. N82-13395
HARPER, C. M. N82-13256
HARPER, L. R. N82-13076
HARRIS, A. E. N82-13088
N82-13089
HARRIS, B. N82-13280
N82-13284
HARRIS, J. O., JR. N82-13888
HARVEY, A. C. N82-13392
HASANAIN, G. S. N82-13259
HASEN, G. A. N82-13101
HASSAN, M. N82-13492
HASTE, G. R. N82-13912
N82-13913
HAUER, A. N82-13861
HAUSER, J. R. N82-13540
HAVERTY, T. N82-13528
HAYAKAWA, S. N82-13900
HAYDEN, T. E. N82-13388
HAYNES, D. L. N82-13360
HEALY, D. J. N82-13290
HECKER, W. N82-13253
N82-13432
HEEGARD, C. D. N82-13750
HEFFLEY, R. K. N82-13685
HELMLE, L. C. N82-13622
HEMSCH, M. J. N82-13046
HENNIG, P. N82-13117
HERBERT, G. A. N82-13631
HERRMANN, W. N82-13453
HERRO, M. A. N82-13345
HESELIUS, L. H. N82-13456
HESS, R. A. N82-13688
N82-13704
HEWSON, E. W. N82-13518
N82-13519
HIETAMAEKI, M. N82-13553
HIGH, J. N82-13768
HILL, M. W. N82-13557
HIRSCHBERG, M. H. N82-13281
HIRVONEN, J. K. N82-13261
HO, J. H. N82-13470
HOBART, D. E. N82-13182
HOBBS, R. W. N82-14000
N82-14003
HOCHBAUM, A. N82-13940
HODGE, P. E. N82-13509
HOEBBEL, D. N82-13170
HOEHN, F. W. N82-13981
HOHL, F. N82-13415
HOLDHUSEN, J. S. N82-13084
HOLFORD, I. C. R. N82-13574
HOLLA, V. S. N82-13111
HOLLENBERG, G. W. N82-13951
HOLMES, D. R. N82-13441
HOLMES, N. C. N82-13422
N82-13423
HOLT, H. E. N82-14041
HONG, K. Z. N82-13239
HOOVER, D. Q., JR. N82-13511
HOPKINS, R. H. N82-13497
HOPP, W. J. N82-13535
HOPSON, J. N82-13058
HORNE, J. N82-13167
HORNUNG, G. N82-13457
HORSTMANN, H. N82-13547
HORTON, E. T., JR. N82-13339
HOUSKA, C. R. N82-13958
HOVESTADT, D. N82-13600
HOWE, J. T. N82-13637
HOWELL, R. H. N82-13854
HSIA, H. S. N82-13987
HSIA, L. C. N82-13935
HSIEH, S. S. N82-13462
HSIEH, W. C. N82-13238
HSU, T. B. N82-13202
HSU, Y. H. L. N82-13586
HUANG, Z. N82-13198
HUEBNER, W. F. N82-13991
HUFNAGEL, H. N82-13164
HUGHES, D. A. N82-13529
HULTMAN, C. V. N82-13226
HUMMER, R. F. N82-13465
HUMPHRIES, T. S. N82-13216
HUNG, J. M. N82-13235
HUNN, B. D. N82-13263
HUNT, B. L. N82-13067
HUNT, J. N82-13862
HUNT, L. R. N82-13383
HUNT, W. A. N82-13649
HUTCHBY, J. A. N82-13540
HYNEK, S. J. N82-13392
HYZAK, J. M. N82-13529

I

IBADOV, S. I. N82-13994
IBE, O. C. N82-13337
IKUTA, K. N82-13904
ILYASOV, Y. P. N82-13298
INMAN, R. V. N82-13221
INOUE, S. N82-13109
ISHIKAWA, M. N82-13367
ISSA, R. I. N82-13391
ITATANI, R. N82-13899
N82-13906
ITIKAWA, Y. N82-13907
ITO, R. N82-13907
ITOH, N. N82-13907
IZMAYLOV, F. F. N82-13295

J

JACKSON, W. M. N82-14023
JACOBSON, S. H. N82-13966
JAEGER, R. J. N82-13708
JAGO, S. N82-13671
JAIN, R. N82-13196
JAKOB, H. N82-13095
JAKOBOVITS, R. H. N82-13136
JAMES, M. R. N82-13221
JANOSIK, J. N82-13483
JAROSKA, M. F. N82-13408
JARRETT, D. N. N82-13061
JAYARAMAN, N. I. N82-13483
JECK, R. K. N82-13602
JEFFERIES, J. T. N82-14043
JENKINS, R. N82-13207
JENSEN, D. N82-13130
JENSEN, J. E. N82-13517
JENSSEN, H. P. N82-13880
JERMAN, J. H. N82-13200
JESSEY, D. R. N82-13613

JEWELL, W. F. N82-13686
JEX, H. R. N82-13684
N82-13718
JIANG, Q. N82-13670
JOHANSSON, B. N82-13803
N82-13948
JOHANSSON, K. N82-13397
JOHNSON, C. M. N82-13500
JOHNSON, H. D. N82-13249
JOHNSON, R. E. N82-13554
JOHNSON, W. A. N82-13946
JOHNSON, W. R. N82-13645
JOLLEY, R. L. N82-13556
JONES, A. D. N82-13827
JORDAN, E. A. N82-13832
JUNKINS, J. L. N82-13155
JUROSHEK, J. R. N82-13157

K

KACK, D. B. N82-13881
KAILA, K. U. N82-13591
KAISER, M. L. N82-14037
N82-14038
KAKO, M. N82-13900
KANNEL, J. W. N82-13428
KARASEK, R. M. N82-13614
KARLSSON, B. N82-13343
KARO, A. M. N82-13857
KARPEL, M. N82-13147
KARR, A. F. N82-13795
KASTEN, P. R. N82-13871
KATO, T. N82-13900
KATSAMBALOS, K. E. N82-13612
KAUFHERR, T. N82-13822
KAUFMAN, A. N82-13490
KAUKLER, W. F. S. N82-13218
KAWAI, H. N82-13901
KAYE, A. N82-13055
KEIFER, W. S. N82-13563
N82-13564
N82-13569
N82-13570
KELLEY, P. A. N82-13578
KELLEY, W. W. N82-13148
KELLY, J. T. N82-13270
KEMRY, M. M. N82-13401
KENNEDY, B. M. N82-14036
KERLEY, G. I. N82-13224
KERR, A. D. N82-13472
KERSHAW, D. S. N82-13773
KESSEL, P. A. N82-13621
KETTENRING, K. N., JR. N82-13579
KHALAFALLA, S. E. N82-13485
KHALID, R. A. N82-13574
KILAPARTI, S. R. N82-13436
KIM, A. G. N82-13488
KIM, S. S. N82-13196
N82-13201
KIM, T. J. N82-13340
KIM, Y. D. N82-13893
KIMURA, W. D. N82-13425
KING, J. J. N82-13762
KING, M. L. N82-13701
N82-13706
KING, R. W. N82-13647
KINGLESMITH, D. A., III N82-14019
KINZEL, E. S. N82-13968
KIRK, J. A. N82-13199
KIRSCH, K. N82-13654
KISHIO, K. N82-13959
KISSEL, J. N82-13993
KISSELL, F. N. N82-13483
KITAGAWA, S. N82-13905
KLEIN, J. N82-13492
KLEIN, J. A. N82-13560
KLEIN, L. W. N82-13594
KLEIN, R. I. N82-14032
KLEINMAN, D. L. N82-13695
N82-13699
N82-13740
KLEINMAN, D. W. N82-13689
KLENKE, D. J. N82-13046
KLEVENHUSEN, K. D. N82-13095
KLOSTER, M. N82-13137
KLUEH, R. L. N82-13222
KLYUYEV, V. M. N82-13331
KNEISSEL, B. N82-13999
KNIGHT, D. D. N82-13790
KOBAYASHI, Y. N82-13781
KOCH, T. L. N82-13356
KOEHLER, D. E. N82-13435
KOELLING, D. D. N82-13950
KOHNEN, E. N82-13060
KOHOUTEK, L. N82-14006
KOLB, W. N82-13302
KOLOSOV, Y. A. ..... N82-[illegible]13
KOLOT, A. B. N82-13306
KOMORI, A. N82-13913
KONCSEK, J. N82-13066
KORKAN, K. D. N82-13835
KORN, J. N82-13695
KORNFIELD, J. N82-13469
KORTH, A. N82-13601
KOSKI, O. H. N82-13409
KOSMODAMIANSKAYA, N. S. N82-13315
KOTZIN, M. D. N82-13344
KOWN, B. T. N82-13256
KRAIGE, L. G. N82-13155
KRAJNOVICH, D. J. N82-13887
KRALL, N. A. N82-13919
KRAMER, A. N82-13667
KRAUSE, D., JR. N82-13189
KREIFELDT, J. G. N82-13721
KREMENETSKIY, S. D. N82-13309
N82-13310
KREMSER, G. N82-13601
KUBO, S. N82-13901
KULFAN, R. M. N82-13098
KUMAR, A. N82-13142
KUNDU, P. K. N82-13973
KUO, S. C. N82-13390
KUROCHKIN, A. P. N82-13313
KUTUZOV, S. M. N82-13298
KUZMIN, A. A. N82-13305
KWO, J. R. N82-13932
KWOK, H. S. N82-13887

L

LAEGREID, M. M. N82-13566
LAGERKVIST, K. O. N82-13548
LAGMAN, L. N82-13397
LAGUNA, G. R. N82-13888
LAI, T. H. N82-13734
LAMAIN, L. G. N82-13778
LAMB, M. N82-13110
LANCASTER, P. A. N82-13057
LANE, K. R. ..... N82-13[illegible]37
LANE, N. N82-13058
LANGFORD, G. N82-13260
LAPRAD, R. F. N82-13145
LARKO, D. N82-13473
LARSON, D. J. N82-13188
LARSON, J. S. N82-13480
LARSON, R. E. N82-13602
LARSON, S. M. N82-14005
LARUELLE, G. N82-13081
N82-13082
LAUBER, J. K. N82-13123
N82-13124
LAUGHER, R. D. N82-13092
LAUGHREY, J. A. N82-13075
LAUSE, A. L. N82-13250
LAUSON, H. S. N82-13453
LAWRENCE, J. A. N82-13692
LEAR, R. D. N82-13889
LEBALLEUR, J. C. N82-13384
LEBLANC, Y. N82-14037
LEBOFSKY, M. N82-14001
LECACHEUX, A. N82-14037
LECHT, C. P. N82-13976
LEE, C. H. N82-13426
LEE, D. D. N82-13245
LEE, J. Y. N82-13402
LEE, M. L. N82-13557
LEE, W. B. N82-13985
LEE, Y. N82-13403
LEE, Y. T. N82-13887
LEGALL, G. N82-13094
LEHMAN, G. L. N82-13855
LEHMAN, S. L. N82-13713
LEHTO, D. L. ..... N82-134[illegible]9
LEIBOLD, G. N82-13164
LEIFER, M. C. N82-13648
LENGRAND, J. C. N82-13385
LEPPING, R. P. N82-13594
LEUCHT, P. M. N82-13681
LEVEY, R. A. N82-13580
LEVIN, B. M. N82-13314
LEVIN, O. I. N82-13329
LEVISON, W. H. N82-13687
N82-13694
N82-13720
LEVY, A. N82-13246
LEW, K. Q. N82-13554
LEWIS, J. L. N82-13719
LEWIS, W. N82-13703
LEYNAERT, J. N82-13091
LI, H. H. N82-13879
LICHTENSTEIN, S. N82-13817
LIDA, A. N82-13268
LIDIAK, E. G. N82-13596
LIEBERMAN, M. L. N82-13250
N82-13251
LIEBMAN, I. N82-13412
N82-13489
LILLY, L. N82-13834
LIM, L. K. N82-13234
LIN, L. N82-13228
LINDBERG, B. N82-13800
N82-13801
LINDENBAUM, S. J. N82-13825
LINDLEY, D. V. N82-13792
LINDSEY, C. N82-14043
LING, A. C. N82-13186
LINTON, P. M. N82-13062
LINZ, A. N82-13880
LIPPAY, A. N82-13701
N82-13706
LIPSCHUTZ, R. N82-13473
LIPSCHUTZ, R. D. N82-13561
LISY, J. M. N82-13887
LITTLE, J. R. N82-13538
LIU, G. N82-13220
LIU, S. H. N82-13953
LO, J. N82-13236
LOFGREN, E. M. N82-14040
LOFGREN, G. E. N82-14040
LONGANBACH, J. R. N82-13246
LONGMIRE, J. L. N82-13925
LORD, F. M. N82-13816
LORENZ, B. E. N82-13371
LOS, V. F. N82-13315
LOSEV, Y. S. N82-13332
LOWELL, C. E. N82-13509
LU, D. J. N82-13751
LU, J. N82-13979
LUCAS, R. G. N82-13226
LUCCHI, C. W. N82-13072
LUEG, H. N82-13341
LUH, R. C. C. N82-13838
LUMME, E. N82-13553
LUTZ, M. N82-13411
LYMAN, J. N82-13676
LYNCH, M. J. N82-13199
LYNCH, N. A. N82-13742
LYONS, V. J. N82-13143

M

MACK, J. N82-13861
MACMILLAN, W. L. N82-13085
MACPHERSON, R. W. N82-13421
MADNI, A. N82-13683
MADSEN, W. W. N82-13971
MAEKAWA, T. N82-13901
MAHMOUD, M. Y. N82-13891
MAJUMDAR, B. S. N82-13960
MAKAY, E. N82-13431
MAKSIMOVIC, S. D. N82-13487
MALEKI, N. N82-13844
MALLON, C. N82-13167
MALONE, R. N82-13890
MALUSHKOV, G. D. N82-13321
MAMANE, Y. N82-13572
MANDURAH, M. M. N82-13964
MANEY, R. T. N82-13225
MANGELSON, N. F. N82-13557
MANNING, J. N82-13890
MANTAY, W. R. N82-13107
MARAN, S. P. N82-14003
MARCHI, D. L. N82-13250
MARDESICH, N. N82-13501
MARKS, K. E. N82-13979
MARSDEN, B. G. N82-14039
MARSHALL, W. F. N82-13435

MARTIN, G. P. N82-13339
MARTIN, W. A. N82-13797
MARTINSON, C. R. N82-13597
MASHBURN, J. D. N82-13787
MASON, R. L. N82-13986
MASSEY, H. G. N82-13979
MATSUDA, Y. N82-13920
MATTOX, D. M. N82-13154
MAUREAU, C. N82-13052
MAY, N. N82-13653
MAYER, L. A. N82-13186
MAZZOLAI, F. M. N82-13836
MCCABE, M. E. N82-13549
MCCALL, G. N82-13861
MCCARTHY, M. E. N82-13721
MCCONVILLE, J. T. N82-13724
MCCORMICK, M. P. N82-13592
MCCROSKY, R. E. N82-14039
MCCROSSON, F. J. N82-13525
N82-13526
MCDERMOTT, M. N82-13696
MCDONALD, J. A. N82-13563
N82-13564
N82-13569
N82-13570
MCDOWELL, W. J. N82-13977
MCFEETERS, T. L. N82-13195
MCGLONE, M. E. N82-13145
MCGREGOR, I. N82-13068
MCHARG, B. N82-13978
MCHUGH, J. P. N82-13497
MCKENNA, S. J. N82-14031
MCKINNON, G. M. N82-13701
N82-13706
MCLEOD, P. N82-13703
MCMAHAN, A. K. N82-13948
N82-13955
MCMURTREY, C. D. N82-13971
MCNALLY, W. D. N82-13113
MCRUER, D. T. N82-13716
MEAD, J. M. N82-14020
MECKSTROTH, E. A. N82-13884
MEHTA, H. N82-13963
MEIER, D. N82-13497
MEIER, H. N82-13253
N82-13432
MELANCON, J. L. N82-13266
MELOCCO, J. M. N82-13056
MENGEL, E. E. N82-13512
MENU, J. P. N82-13059
MEREDITH, R. N82-13828
N82-13829
N82-13830
MERILAINEN, C. A. N82-13356
MERRICK, E. B. N82-13270
METRIKIN, A. A. N82-13308
MEYER, A. E. N82-13647
MEYER, M. M. N82-13821
MEYYAPPAN, M. N82-13154
MICHELSON, D. C. N82-13977
MIHALOEW, J. R. N82-13144
MILES, J. N82-13947
MILHAM, M. E. N82-13882
MILLER, G. W. N82-13814
MILLER, M. T. N82-13874
MILLES, M. F. N82-13946
MILLIGAN, R. T. N82-13256
MILLIGAN, R. V. N82-13446
MILLING, R. W. N82-13120
MILTON, K. N82-13872
MIMURA, F. N82-13109
MIROVITSKIY, D. I. N82-13296
N82-13326
MISHKIN, A. H. N82-13676
MISHRA, M. K. N82-13869
MIURA, H. N82-13151
MIXON, M. N. N82-13574
MOEN, J. N82-13640
MOGES, T. N82-13788
MOHAN, N. N82-13537
MOIR, I. N82-13057
MOLINELLI, E. N82-13834
MOLLO-CHRISTENSEN, E. N82-13642
MOLNAR, J. N82-13169
MOLODOV, B. I. N82-13330
MONCARZ, P. D. N82-13588
MONK, D. N82-13720
MOONEY, J. B. N82-13360
MOORES, R. J. N82-13219
MOORING, B. W. N82-13696
MORGAN, J. L. N82-13908
MORITA, K. N82-13907
MORRIS, H. N82-13358
MORRIS, N. D. N82-13651
MORRIS, W. D. N82-13468
MORRIS, W. L. N82-13221
MORRISON, E. L. N82-13157
MORRISON, S. R. N82-13187
MOSHER, D. N82-13852
MOSHER, D. M. N82-13965
MOSKOWITZ, H. N82-13709
MOSS, R. W. N82-13063
MOXEY, C. N82-13057
MUCINO-QUINTERO, V. H. N82-13437
MUELLER, K. H. N82-13972
MULLEN, R. L. N82-13381
MULLER, F. M. N82-13950
MULLINS, C. J. N82-13725
MUNNIKSMA, B. N82-13090
MUNUKUTLA, S. S. N82-13104
MURTHA, M. J. N82-13191
MYERS, G. N82-13711
MYERS, M. T. N82-13416
MYNICK, H. E. N82-13924
MYRONIK, D. J. N82-13186

N

NAGAMOTO, C. N82-13633
NAGEL, H. N82-13077
NAGEL, J. N82-13777
NAGL, W. N82-13164
NAGY, T. A. N82-14020
NAKAJIMA, N. N82-13899
NAKAMURA, M. N82-13901
NAM, M. H. N82-13712
NAQVI, S. M. N82-13655
NARAYAN, S. S. R. N82-13346
NASSI-F, M. N82-13661
NELMS, W. P. N82-13067
NELSON, D. B. N82-13922
NELSON, R. M. N82-13550
NESKE, E. N82-13169
NESLEN, J. W. N82-13808
NEUBAUER, F. M. N82-13594
NEVINS, W. M. N82-13920
NEWBURN, R. L. N82-14026
NEWTON, M. D. N82-13856
NICKERSON, E. N82-13633
NIEBERLEIN, V. A. N82-13363
NIEDNER, M. B., JR. N82-13992
NIGAM, A. N82-13756
NIKOLITSCH, D. N82-13115
N82-13117
NIR, Z. N82-13171
NISSIM, Y. I. N82-13943
NITSCHE, W. N82-13396
NIVEN, W. A. N82-13408
NIXON, R. A., III N82-13615
NOHEL, J. A. N82-13791
NOLT, I. N82-13633
NOMURA, Y. N82-13900
NORDSTROM, T. V. N82-13366
NORTHCLIFFE, L. C. N82-13859
NORVELL, V. E. N82-13183
NOTTER, A. T. N82-13273
NOUSE, H. N82-13109
NOWACK, H. N82-13277
N82-13279
NUNN, H. T. N82-13125
NUNN, J. A. N82-13582
NUNZIATO, J. W. N82-13452

O

OBRIEN, G. F. N82-13806
OGUZ, E. A. N82-13102
OH, S. Y. N82-13372
OHNUMA, T. N82-13903
OHUCHI, F. N82-13961
OKEEFE, T. J. N82-13227
OKELLY, K. N82-13164
OLIVER, W. C. N82-13229
OLNESS, D. U. N82-13244
OMURA, J. K. N82-13301
ONEILL, W. D. N82-13698
ORLANDO, T. P. N82-13942
ORLOSKI, M. J. N82-13549
ORME, J. R. N82-13434
ORPHAN, V. J. N82-13884
ORRALL, F. N82-14043
ORTEGA, J. K. E. N82-13264
OSBORN, A. G. N82-13249
OSIPOV, L. S. N82-13326
OTTINGER, P. F. N82-13852
OUNAYEVSKY, V. A. N82-13463
OUYANG, C. F. N82-13608

P

PACE, P. N82-13420
PACHARINTANAKUL, P. N82-14034
PALMER, E. N82-13671
PAM, R. L. N82-13270
PAN, J. J. N82-13339
PANE, J. P. N. N82-13226
PANOFSKY, H. A. N82-13473
PANTELL, R. H. N82-13818
PAPIN, J. P. N82-13059
PARASURAMAN, R. N82-13670
PARKER, H. W. N82-13243
PARKINSON, C. L. N82-13623
PARTLOW, D. P. N82-13154
PARUNGO, F. N82-13633
PARUNGO, F. P. N82-13572
PATEL, K. V. N82-13444
PATIL, R. S. N82-13797
PATRICK, W. H., JR. N82-13574
PATTIPATI, K. R. N82-13740
PAUL, H. R. N82-13269
PAYNE, T. S. N82-13752
PEASE, D. J. N82-13753
PEDERSEN, B. M. N82-14037
PEERY, K. M. N82-13079
PELLEGRINO, J. M. N82-13945
PENG, P. N82-13711
PENKUHN, H. N82-13864
PERIN, R. N82-13087
PERLIS, D. R. N82-13757
PERLMUTTER, A. L. N82-13660
PERRAULT, J. E., JR. N82-13785
PERRIER, P. N82-13082
PERRY, F. C. N82-13190
PESSAGNO, S. L. N82-13510
PETERS, J. A. N82-13575
PETERSHAGEN, H. N82-13455
PETERSON, R. D. N82-13438
PETICOLAS, J. D. N82-13680
PETTEY, J. E. N82-13606
PETTY, S. E. N82-13566
PHATAK, A. V. N82-13690
PHILLIPS, L. D. N82-13817
PHILLIPS, L. R. N82-13557
PHILLIPS, M. W. N82-13923
PIATT, D. M. N82-13242
PISTOLKORS, A. A. N82-13320
PITCHUMANI, V. N82-13783
PLAVEC, M. J. N82-14027
PLOG, C. N82-13546
POLAND, J. F. N82-13466
POOL, A. N82-13140
POPERECHENKO, V. A. N82-13328
PORTERFIELD, J. L. N82-13720
POSEY, L. D. N82-13365
POST, M. E. N82-13557
POULTON, C. N82-13703
POWELL, W. R. N82-13512
POZNIAK, O. M. N82-13080
PRADELLOK, W. N82-13171
PRAGER, S. C. N82-13923
PRASTHOFER, W. P. N82-13376
PRICE, J. P. N82-13559
PRIEST, A. J. N82-13068
PRINCE, K. R. N82-13481
PUCCINELLI, E. F. N82-13469
PUESCHEL, R. F. N82-13572
N82-13573
PUGH, G. N82-13089
PURI, P. N82-13452

Q

QUINN, A. K. N82-13811

R

RABIN, J. M. N82-13941
RABINOVICH, Y. Y. N82-13314
RADOSEVICH, L. G. N82-13530
RAGHURAMAN, P. N82-13533
RAHE, J. N82-13989
N82-14006
N82-14017
N82-14024
RAJARAM, N. S. N82-13723
RAMALINGAM, S. N82-13261
RAMSDELL, J. V. N82-13627
RANADIVE, V. N82-13673
RANTAKRANS, E. N82-13553
RAO, H. G. N82-13619
RAO, P. J. N82-13111
RASMUSSEN, S. N82-13342
RAY, J. C. N82-13512
RAY, L. D. N82-13680
REE, M. N82-13725
REED, R. P. N82-13928
REEVES, G. A. N82-13422
N82-13423
REID, J. W. N82-13339
REILLY, M. J. N82-13243
REIMER, B. N82-13411
REIMERS, G. W. N82-13485
REINHARD, R. N82-14025
RENKSIZBULUT, M. N82-13379
REPA, B. S. N82-13681
REPPERGER, D. W. N82-13668
RESHEIDAT, M. R. N82-13443
REWICK, R. T. N82-13360
RHODES, H. L. N82-13413
RICCO N82-13433
RICHLEN, S. L. N82-13971
RICHMOND, J. K. N82-13489
RICHTER, B. E. N82-13557
RICHTER, H. N82-13164
RICKARD, W. W. N82-13687
RIEKE, G. N82-14001
RIFFIN, M. N82-13385
ROBERTS, B. R. N82-13382
ROBERTS, D. W. N82-13096
ROBINETTE, K. N82-13724
ROCHELEAU, R. E. N82-13551
ROCK, S. M. N82-13145
ROCKWELL, T. H. N82-13662
N82-13663
RODDY, J. W. N82-13977
RODRIGUEZ, M. A. N82-13347
ROEHRLE, H. N82-13457
ROELKE, R. J. N82-13114
ROGACHEV, A. I. N82-13331
ROGERS, D. B. N82-13668
ROMANOSKY, R. R. N82-13193
ROMIG, J. H. N82-14037
ROMINGER, C. G. N82-13499
ROPCHAN, W. T. N82-13203
ROSENBLUTH, M. M. N82-13916
ROSENDAL, H. E. N82-13634
ROSS, J. A. N82-13068
ROSS, W. N82-13667
ROSSEEL, T. M. N82-13184
ROTH, M. N82-13589
ROTH, S. P. N82-13144
ROWENBLUTH, M. N. N82-13915
ROY, R. N82-13419
RUBIN, M. N82-13524
RUBINSON, J. F. N82-13185
RUBY, J. D. N82-13256
RUDNITSKI, D. M. N82-13085
RUFF, L. J. N82-13598
RUIZ, R. N82-13543
RUOFF, C. N82-13768
RUSSELL, D. L. N82-13079
RUSSELL, M. C. N82-13533
RYAN, D. L., III N82-13387
RYBSKI, P. M. N82-14010
RYDER, J. F. N82-13557

S

SABIERS, R. L. N82-13427
SACH, E. N82-13164
SAGE, J. P. N82-13364
SAHA, S. K. N82-13937
SAHNI, S. N82-13734
N82-13820
SAKAI, J. I. N82-14042
SAKURAI, K. N82-13902
SAMARKANDY, M. K. N82-13159
SANDBERG, B. N82-13410
SANDERSON, K. C. N82-13140
SANDFORD, M. T., II N82-14032
SANTUCCI, G. N82-13059
SAPONAS, T. G. N82-13739
SARI, H. N82-13776
SAROHIA, V. N82-13386
SATRAN, D. R. N82-13047
SAUND, E. N82-13768
SAWYER, W. C. N82-13110
SAYLORS, M. N82-13914
SCARAMANGAS, A. A. N82-13458
SCHAFFER, C. L. N82-13249
SCHEININE, A. L. N82-13514
SCHEUERMANN, H. N82-13411
SCHIFLETT, S. G. N82-13062
SCHMIDT, D. A. N82-13759
SCHMIDT, D. K. N82-13150
N82-13693
SCHMIDT, D. W. N82-13118
SCHNELL, R. N82-13633
SCHNOOR, J. J. N82-13527
SCHNUR, G. F. O. N82-14006
SCHREITMUELLER, W. N82-13342
SCHROEDER, H. W. N82-13546
SCHRUBEN, J. N82-13497
SCHUBERT, F. H. N82-13508
SCHUETZ, D. N82-13276
N82-13278
SCHULMAN, T. M. N82-13685
SCHULTZ, D. F. N82-13509
SCHULTZ, S. G. N82-13175
SCHUURMAN, W. N82-13927
SCHWAB, T. F. N82-13804
SCHWARTZ, A. N82-13254
SCOTT-MONCK, J. N82-13491
SCOUGTON, C. R. N82-13054
SEAGER, C. H. N82-13956
SEEBURGER, D. A. N82-13616
SEIDENSTICKER, R. G. N82-13497
SEIDL, P. B. N82-13605
SELIGSON, J. L. N82-13875
SELKOWITZ, S. N82-13524
SENTER, P. K. N82-13262
SERFLING, R. J. N82-13795
SESSA, R. N82-13134
SHALABY, H. M. M. N82-13210
SHANABROOK, B. V. N82-13933
SHANER, J. W. N82-13223
SHANNON, R. H. N82-13650
SHAO-HUA, Y. N82-13160
SHEA, S. P. N82-13552
SHEARER, C. C. N82-13273
SHEN, L. C. N82-13805
SHEN, Y. R. N82-13887
SHENG, L. H. N82-13271
SHEPPARD, J. C. N82-13894
SHERIDAN, T. B. N82-13673
N82-13697
SHERMAN, K. N82-13711
SHERWIN, P. N82-13131
SHIAH, S. P. N82-13659
SHIMOZUMA, T. N82-13901
SHIRACHI, D. K. N82-13664
SHIRANI-CHAHARSUGHI, E. N82-13405
SHIRK, D. G. N82-13743
SHIRLEY, D. J. N82-13638
SHIRLEY, R. S. N82-13664
SHOEMAKER, C. E. N82-13515
SHOTTING, K. F. N82-13738
SHU, H. T. N82-13390
SHYR, Y. S. N82-13204
SIANG, H. N82-13404
SIAPKARA, A. A. N82-13697
SIEBENHAAR, A. N82-13427
SIGALLA, A. N82-13098
SIMMON, W. N82-13862
SIMMONS, R. O. N82-13949
SIMON, M. K. N82-13301
SIMON, N. J. N82-13928
SIMON, R. K., JR. N82-13646
SIMONS, M. N82-13540
SINGH, A. K. N82-13754
SIOMOS, K. N82-13194
SISTANIZADEH N82-13362
SKLAD, P. S. N82-13855
SKOW, M. L. N82-13488
SKRIVER, H. L. N82-13948
SMALLEY, W. M. N82-13985
SMELTZER, D. B. N82-13067
SMIDT, F. A. N82-13261
SMILEY, A. N82-13709
SMITH, D. H. N82-13516
SMITH, E. K. N82-13300
SMITH, H. D. N82-13154
SMITH, J. L. N82-13950
SMITH, J. M. N82-13908
SMITH, J. W. N82-13149
SMITH, T. M. N82-13958
SMITH, W. H. N82-14011
SMYTH, R. N82-13086
N82-13116
SNOW, G. C. N82-13510
SNYDER, L. N82-13735
SNYDER, L. E. N82-14002
SOCKOL, P. M. N82-13113
SOLOMON, S. B. N82-13651
SOMMERVILLE, J. N82-13128
SORENSEN, J. A. N82-13690
SPARKS, E. N82-13514
SPECK, R. N82-13862
SPERLING, J. L. N82-13919
SPICUZZA, R. J. N82-13062
SPIETH, M. A. N82-13617
SPONG, D. A. N82-13911
N82-13915
N82-13916
N82-13922
SRIFUENGFUNG, D. N82-13271
ST.LAWRENCE, W. F. N82-13471
STALLINGS, T. L. N82-13249
STAMPER, K. R. N82-13435
STANALAND, W. D. N82-13373
STANTON, L. N82-13682
STARK, L. N82-13710
N82-13711
N82-13712
N82-13713
STARR, G. P. N82-13675
STAUSBERG, H. N82-13411
STEIGER, U. R. N82-13849
STEIN, A. C. N82-13684
N82-13718
STEIN, H. N82-13060
STEININGER, K. N82-13726
STELLA, P. N82-13491
STENZEL, R. A. N82-13256
STEPHENS, P. N82-13152
STEWART, A. G. N82-13513
STEWART, L. C. N82-13784
STOCKS, C. P. N82-13074
STOLTZ, P. M. N82-13122
STONE, G. N82-13473
STOVER, E. N82-13861
STOVER, H. A. N82-13303
STRONG, R. B. N82-13563
N82-13569
N82-13570
STRUCK, H. N82-13095
STRUL, B. N82-13293
STURM, T. W. N82-13476
SU, J. M. N82-13696
SUBRAMANIAN, R. S. N82-13154
SUN, F. N82-13711
SUN, L. A. N82-13819
SUN, P. T. N82-13292
SUNADA, W. H. N82-13460
SUNWOO, H. N82-13230
SUPORNSILAPHACHAI, B. N82-13464
SURBER, L. N82-13066
SUTTON, A. P. N82-13962
SUTTON, W. G. N82-13930
SVENSSON, P. N82-13779
SWAFFIELD, J. A. N82-13399
SWAMI, T. K. G. N82-13231
SWANGER, H. J. N82-13584
SWANSON, R. E. N82-13853
SWANSON, R. L. N82-13054
SWEENEY, M. A. N82-13190
SWENSON, E. L. N82-13270
SWENT, R. L. N82-13818
SWISHER, J. N82-13265
SYBERG, J. N82-13066

T

TABATA, T. N82-13907
TACINA, R. R. N82-13504
TAKAHARA, K. N82-13109
TANAHASHI, S. N82-13902
TANAKA, K. N82-13872
TANAKA, S. N82-13901
TATTELMAN, P. N82-13624
TAVELLA, D. A. N82-13121
TAYLOR, R. J. N82-13512
TAYLOR, R. W. N82-13543
TECZA, J. A. N82-13430
TEGLAS, R. G. N82-13786
TERUMICHI, Y. N82-13901
THACKSTON, M. G. N82-13870
THAYER, D. N82-13890
THIELE, G. A. N82-13340
THOM, R. D. N82-13356
THOMAS, R. A. N82-13517
THOREN, R. J. N82-13505
THORNTON, A. L. N82-13885
THUOT, M. E. N82-13925
TIEN, J. S. N82-13507
TIEN, K. F. N82-13823
TIMMONS, M. L. N82-13540
TOI, K. N82-13902
N82-13905
TOMLINSON, P. N. N82-13273
TOMMERDAHL, J. B. N82-13563
N02-13569
N82-13570
TONG, H. N82-13510
TOPPER, T. H. N82-13285
TORGOVANOV, V. A. N82-13299
TRACY, C. A. N82-13541
TRAINOR, R. J. N82-13422
N82-13423
TRAMER, A. N82-13887
TRAN, M. D. N82-13969
TRAUB, B. N82-13126
TRAYNOR, G. W. N82-13561
TRENDLER, P. H. H. N82-13273
TRIEBES, K. N82-13220
TROITSKIY, V. I. N82-13313
TRUBEY, D. K. N82-13863
TRUDELL, R. W. N82-13764
TRUSKANOV, D. M. N82-13319
TSAI, C. N82-13809
TSANG, K. T. N82-13917
N82-13918
TSCHIRWITZ, U. N82-13253
N82-13432
TURKEL, B. S. N82-13621
TURNER, G. N82-13988
TYAPTIN, M. M. N82-13298

U

UCKAN, N. A. N82-13912
N82-13922
ULLRICH, H. N82-13369
UMRIGAR, C. J. N82-13936
UNGER, E. N82-13432
UNGER, L. M. N82-13863
UPTON, D. T. N82-13465
URBAN, F. K., III N82-13232
URENA, J. L. N82-13766
USIN, V. A. N82-13325
USRY, J. W. N82-13468
USUI, H. N82-13109
USUI, S. N82-13711

V

V.D.KOLK, J. T. N82-13093
VALOVCIN, F. R. N82-13625
VANBOGART, J. W. C. N82-13240
VANCE, R. L. N82-13841
VANDAM, J. W. N82-13915
N82-13916
VANDENBERG, D. M. N82-13360
VANDENBERG, J. D. N82-13715
VANDEURSEN, A. P. J. N82-13950
VANENGELEN, J. A. J. N82-13090
VANHENGST, J. N82-13093
VANHULSTEYN, D. N82-13861
VANRUITENBEEK, J. M. N82-13950
VANSTRATUM, B. G. N82-13199
VANVALIN, C. C. N82-13572
N82-13573
VEDOVA, R. N82-13077
VEESER, L. R. N82-13422
N82-13423
VENGROVICH, L. A. N82-13312
VERGA, R. L. N82-13982
VERHOEF, W. A. N82-13950
VERNON, M. F. N82-13887
VIDMAR, R. J. N82-13897
VIETS, H. N82-13835
VIGERSTAD, T. J. N82-13525
VILLA, F. J. N82-13250
VINEBERG, M. N82-13438
VISBAL, M. N82-13790
VITEK, J. M. N82-13222
VITKEVICH, V. V. N82-13298
VITKO, J., JR. N82-13530
VOGL, O. N82-13171
VONDESSONNECK, K. N82-13334
VONSCHONFELDT, H. N82-13196
VOOGT, N. N82-13093
VRENTAS, C. M. J. N82-13241

W

WAHLSTROEM, S. N82-13410
WALKER, B. E. N82-13378
WALKER, D. H. N82-13392
WALLIN, M. N82-13553
WALSDORFER, H. N82-13411
WAMSLEY, R. M. N82-13262
WANG, J. J. H. N82-13336
WANG, S. C. N82-13846
WANG, S. Y. N82-13908
WARBURTON, R. E. N82-13078
WARD, D. E. N82-13350
WARD, J. M. N82-13449
WARE, J. R. N82-13689
WARNER, R. W. N82-13177
WARREN, W. N82-13862
WARREN, W. H., JR. N82-14020
WARUSZEWSKI, H. L. N82-13051
WARWICK, J. W. N82-14037
WASHIMI, H. N82-14042
WASSUM, D. L. N82-13110
WATANABE, T. N82-13903
WATERBURY, G. R. N82-13565
WATERS, J. W. N82-13300
WATT, M. H. N82-13482
WEBER, G. E. N82-13581
WEBSTER, L. N82-13273
WEDDELL, L. L. D. N82-13176
WEEKES, M. C. N82-13256
WEEKS, C. J. N82-13166
WEI, M. S. N82-13931
WEIBULL, T. N82-13802
WEIDNER, R. J. N82-13810
WEINREICH, H. L. N82-13116
WEINSTEIN, I. N82-13383
WEISSHAAR, T. A. N82-13150
WELGE, H. R. N82-13097
WELLMAN, D. L. N82-13572
N82-13573
WEN, C. Y. N82-13198
WENNERHOLM, H. N82-13548
WERNER, M. N82-14043
WESTMANN, R. N82-13451
WESTON, R. P. N82-13103
WESTWIG, R. A. N82-13881
WEWERINKE, P. H. N82-13714
WHANG, K. W. N82-13896
WHIPPLE, F. L. N82-14015
WHITAKER, R. W. N82-14032
WHITE, J. H. N82-13563
N82-13569
WHITE, R. H. N82-13570
WHITE, T. D. N82-13442
WHITEHEAD, J. N82-13129
WHITEHEAD, W. C. N82-13339
WHITLOCK, C. H. N82-13468
WHITTEN, K. L. N82-13333
WHITTIER, J. P. N82-13527
WICKENS, C. N82-13667
WIE, B. N82-13168
WIERWILLE, W. W. N82-13681
WIGHTMAN, J. B. N82-13270
WILBANKS, T. J. N82-13536
WILCOX, W. R. N82-13154
WILENSKY, G. D. N82-13970
WILKENFELD, J. N82-13167
WILLIAMS, R. R. N82-13895
WILLIAMS, T. L. N82-13067
WILLIS, P. B. N82-13503
WILLIS, R. L. N82-13997
WILLMER, A. C. N82-13070
WILSON, D. N82-13861
WILSON, R. N. N82-13282
WINTERBAUER, C. E. N82-13737
WINTERBURN, R. F. J. N82-13639
WINTERS, J. M. N82-13712
WITTE, W. G. N82-13468
WOHLGEMUTH, J. H. N82-13514
WOLTJER, L. N82-14028
WONG, T. T. Y. N82-13351
WOOD, B. D. N82-13534
WOOD, H. J. N82-14018
WOODRUFF, W. R. N82-13407
WOOLLARD, G. P. N82-13599
WOOLLETT, R. R. N82-13112
WRIGHT, H. E., JR. N82-13475
WRIGHT, M. D. N82-13418
WRIGHT, T. W. N82-13447
WRIGLEY, R. C. N82-13637
WRZESINSKY, R. N82-13342
WU, D. M. W. N82-13585
WU, Y. C. L. N82-13367
WYCKOFF, S. N82-14007

X

XIEYUAN, Y. N82-13045
XIROUCHAKIS, P. C. N82-13471

Y

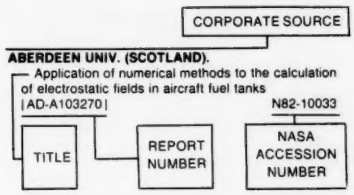
YAMAMOTO, A. N82-13109
YAMAZAKI, Y. N82-13901
YANO, L. I. N82-13764
YASUE, S. N82-13902
YATES, D. N82-13250
YEAGER, W. T. N82-13107
YEATS, R. N82-13334
YEDAVALLI, R. N82-13158
YEN, W. W. S. N82-13527
YEOMANS, D. K. N82-13995
YERMIA, M. N82-13094
YERUKHIMOVICH, Y. A. N82-13308
YIM, Y. G. N82-13256
YIN, Y. K. N82-13705
YNGVE, P. W. N82-13526
YORKA, S. B. N82-14033
YOUNG, B. G. N82-13156
YOUNG, C. T., II N82-13439
YU, J. N82-13451
YUSUF, N. A. N82-13839

Z

ZACHARIAS, G. L. N82-13720
ZACHARY, W. N82-13058
ZACHOR, A. S. N82-13883
ZANDER, F. H. N82-13526
ZBAR, F. S. N82-13632
ZDASIUK, G. A. N82-13417
ZEITLER, G. N82-13253
ZEPKO, T. M. N82-13767
ZERULL, R. H. N82-13999
ZHUKOVIMA, M. Y. N82-13309
ZIEDMAN, K. N82-13709
ZIEMS, L. D. N82-13155
ZIMIN, S. N. N82-13308
ZIMMERHACKL, E. N82-13253
ZOLCINSKI, M. C. S. N82-14029
ZORZI, E. S. N82-13430
ZUB, R. W. N82-13986
ZUCCA, J. J. N82-13583
ZUCKERMAN, S. L. N82-13769
ZUGARO, F. F. N82-13428

CORPORATE SOURCE INDEX

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The titles are arranged under each corporate source in ascending accession number order.

A

ABERDEEN PROVING GROUND, MD.
Electronic measurement of airblast overpressure [AD-A105379] N82-13389

ACADEMIA SINICA, PEKING (CHINA).
Satellite attitude control with decomposed controller [LOG-G668] N82-13160

ACADEMY OF SCIENCES (USSR), DUSHANBE.
New problems of cometary observations from space N82-13994

ACUREX CORP., MOUNTAIN VIEW, CALIF.
Titanium response to a nuclear radiation environment [AD-A102516] N82-13220
Pilot-scale development of a low-NOx coal-fired tangential system [PB81-242513] N82-13270
Development of a high-temperature durable catalyst for use in catalytic combustors for advanced automotive gas turbine engines [NASA-CR-165396] N82-13510

ADELAIDE UNIV. (AUSTRALIA).
Determination of two-stroke engine exhaust noise by the method of characteristics [NASA-TM-84061] N82-13827

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, NEUILLY-SUR-SEINE (FRANCE).
The impact of new guidance and control systems on military aircraft cockpit design [AGARD-CP-312] N82-13048
Aerodynamics of Power Plant Installation [AGARD-CP-301] N82-13065
Practical aspects of instrumentation system installation, volume 13 [NASA-TM-84067] N82-13140
Fatigue Test Methodology [AGARD-LS-118] N82-13274
Technical evaluation report on the Fluid Dynamics Panel Symposium on Computation of Viscous-Inviscid Interactions [AGARD-AR-171] N82-13384

AEG-TELEFUNKEN, BACKNANG (WEST GERMANY).
Investigation of modulation methods and system aspects for regenerative satellite-repeater [BMFT-FB-W-80-024] N82-13342

AEG-TELEFUNKEN, WARSTEIN (WEST GERMANY).
Imaging systems for fast electrophotographic processes [BMFT-FB-T-80-183] N82-13411

AERITALIA S.P.A., TORINO (ITALY).
Subsonic military aircraft engine intake: An integrated theoretical experiment design N82-13073

AEROCHEM RESEARCH LABS., INC., PRINCETON, N. J.
Rate coefficients of combustion/fuel conversion reactions by high-temperature photochemistry [DE81-027965] N82-13192

AEROJET NUCLEAR SYSTEMS CO., SACRAMENTO, CALIF.
Low-thrust chemical propulsion system pump technology [NASA-CR-165219] N82-13427

AERONAUTICAL SYSTEMS DIV., WRIGHT-PATTERSON AFB, OHIO.
Color CRT displays for the cockpit N82-13051

AEROSPACE CORP., EL SEGUNDO, CALIF.
Measurements of heavy ions in the low altitude regions of the outer zone [AD-A099453] N82-13600
Two-satellite study of proton drift on quiet days [AD-A104736] N82-13601
Statistical analysis of accelerated temperature aging of semiconductor devices [AD-A099439] N82-13946
Evaluation of techniques for reducing in-use automotive fuel consumption [PB81-233298] N82-13985

AEROSPACE MEDICAL DIV. AEROSPACE MEDICAL RESEARCH LABS. (6570TH), WRIGHT-PATTERSON AFB, OHIO.
A comparison of head and manual control for a position-control pursuit tracking task N82-13720

AEROSPACE MEDICAL RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
A study on task difficulty and acceleration stress N82-13668

AIR FORCE GEOPHYSICS LAB., HANSCOM AFB, MASS.
Joint agency Doppler technology tests [AD-A100208] N82-13335
Field tests of a surface ice accretion measurement system [AD-A100282] N82-13624
DMSP water vapor radiances: A preliminary evaluation [AD-A099305] N82-13625

AIR FORCE HUMAN RESOURCES LAB., BROOKS AFB, TEX.
Weighting of aptitude components based on differences in technical school difficulty [AD-A102045] N82-13725

AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OHIO.
Navier-Stokes solutions for a supersonic coflowing axisymmetric nozzle with a thick annulus N82-13101
Charge trapping in interface doped MNOS structures N82-13930

AIR FORCE SYSTEMS COMMAND, WRIGHT-PATTERSON AFB, OHIO.
Raven aircraft filter-absorber [AD-A098962] N82-13139
The use of the Kirchoff method for asymptotic solution of a problem of the diffraction of a plane wave on dielectric bodies of revolution N82-13295
Cophased directed surface wave splitters using dielectric waveguides N82-13296
Radio astronomical antennas of meter wavelengths N82-13298
Methods of automatic measurement of antenna parameters N82-13299
Antenna (selected articles) [AD-A106474] N82-13311
Some properties of the radiating aperture superdirectionality N82-13312
Solution of the problem of the synthesis of antennas with the aid of a coherent optical system N82-13313
Thin magnetic impedance antennas N82-13314
Open resonators, formed by confocal mirrors with the variable reflection coefficient and the generalized hyper-spheroidal functions N82-13315
Method of the study of complex waveguide junctions with one or several regions of communication N82-13316
Three-stage commutation field of the system of the repeated use of short-wave receiving antennas N82-13317
The development of domestic technology for television transmitting antennas N82-13319
Discrimination of hologram and antenna theory N82-13320
Radiation of an antenna in the form of a ribbed shaft of finite length N82-13321
Possibilities of phase correction on the small reflector in a two-reflector antenna N82-13322
Antenna (selected articles) [AD-A106499] N82-13323
A statistical analysis of irregular quasi-optical lines (beam guides) with the aid of computer(s) N82-13324
One use of methods of the statistical theory of antennas N82-13325
Directed dividers on the metal-dielectric waveguides N82-13326

AIR FORCE WRIGHT AERONAUTICAL LABS., WRIGHT-PATTERSON AFB, OHIO.
Tanker avionics and aircrew complement evaluation N82-13063
Performance of highly integrated inlets for supersonic aircraft N82-13066
Integration of advanced exhaust nozzles N82-13075
Advanced exhaust nozzle technology N82-13078
A numerical investigation of exhaust plume temperature effects on nonaxisymmetric nozzle/afterbody performance N82-13079
Comparison of closed loop model with flight test results N82-13691
Air Force technical objective document FY 1982 [AD-A099741] N82-13982

AIR WEATHER SERVICE, SCOTT AFB, ILL.
Forecasting skill [AD-A099778] N82-13626

AIRCRAFT RESEARCH ASSOCIATION LTD., BEDFORD (ENGLAND).
A review of the effect of Reynolds number on afterbody drag N82-13080
Wind tunnel test and analysis techniques using powered simulators for civil nacelle installation drag assessment N82-13088

AKRON UNIV., OHIO.
Development of advanced rotor-bearing systems for feedwater pumps, phase 2 [DE82-900376] N82-13431

ALASKA UNIV., FAIRBANKS.
Transport and reaction of heavy metals in Alaskan fjord estuaries [DE81-028319] N82-13474
Alaska's Water resources problems and research needs: Institute of Water Resources, five-year research plan [PB81-231920] N82-13477

ALPHATECH, INC., BURLINGTON, MASS.
Modeling human tracking error in several different anti-tank systems N82-13699
AMES LAB., IOWA.
Power-plant fly-ash utilization: A chemical-processing perspective
[DE81-025452] N82-13191
AMHERST COLL., MASS.
Solubilities of dissolved gases in sea water
[AD-A100675] N82-13189
ANALYTICAL MECHANICS ASSOCIATES, INC., MOUNTAIN VIEW, CALIF.
Modeling of the aircraft in-trail-following task during profile descent N82-13690
ANTHROPOLOGY RESEARCH PROJECT, YELLOW SPRINGS, OHIO.
Anthropometric sizing systems for Army women's field clothing
[AD-A102104] N82-13724
APPLIED MICROWAVE PLASMA CONCEPTS, ENCINITAS, CALIF.
Rudimentary theories of the stability of microwave-heated plasmas N82-13910
APPLIED PHYSICS LAB., JOHNS HOPKINS UNIV., LAUREL, MD.
Alternate hybrid power sources for remote site applications
[AD-A099471] N82-13512
ARINC RESEARCH CORP., ANNAPOLIS, MD.
The 30/20 GHz communications satellite trunking network study
[NASA-CR-165467] N82-13302
ARIZONA STATE UNIV., TEMPE.
Two-path model of fading in a high data rate communication channel N82-13292
Experimental and analytical systems studies of a combined thermal-photovoltaic residential solar system
[DE81-029539] N82-13534
Ground-based cometary spectroscopy N82-14007
ARIZONA UNIV., TUCSON.
Infrared observations of faint comets N82-14001
A systematic program of cometary spectroscopy N82-14005
ARKANSAS UNIV., FAYETTEVILLE.
Economic and kinetic studies of the biological production of farm energy and chemicals from biomass
[DE82-000044] N82-13542
ARMED FORCES RADIOBIOLOGY RESEARCH INST., BETHESDA, MD.
Neurotransmitter function in the basal ganglia after acute and chronic ethanol treatment
[AD-A103744] N82-13649
ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND, ABERDEEN PROVING GROUND, MD.
Determination of optical constants from extinction measurements
[AD-A099494] N82-13882
ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND, WATERVLIET, N. Y.
Moment-strain relationships in elastic-plastic bending of beams
[AD-A101722] N82-13446
ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND, CLEVELAND, OHIO.
The effect of rotor blade thickness and surface finish on the performance of a small axial flow turbine
[NASA-TM-82726] N82-13114
ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND, HAMPTON, VA.
Wind-tunnel investigation of the effects of blade tip geometry on the interaction of torsional loads and performance for an articulated helicopter rotor
[NASA-TP-1926] N82-13107
ARMY AVIONICS RESEARCH AND DEVELOPMENT ACTIVITY, FORT MONMOUTH, N. J.
Integration of controls and displays in US Army helicopter cockpits N82-13053
ARMY COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N. H.
On the buckling force of floating ice plates
[AD-A103733] N82-13472
Method for measuring brash ice thickness with impulse radar
[AD-A103738] N82-13597
ARMY ELECTRONIC PROVING GROUND, FORT HUACHUCA, ARIZ.
Standard Bit Error Rate (BER) versus received signal level testing
[AD-A104573] N82-13338
ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY, ABERDEEN PROVING GROUND, MD.
Confidence intervals for the reliability of a future system configuration
[AD-A105031] N82-13814
ARMY MISSILE COMMAND, REDSTONE ARSENAL, ALA.
Some experiences with the use of castor oil as a dielectric
[AD-A102348] N82-13363
ARMY RESEARCH OFFICE, RESEARCH TRIANGLE PARK, N. C.
Proceedings of the 1981 Army Numerical Analysis and Computers Conference
[AD-A103175] N82-13727
AUSTRALIAN RADIATION LAB., MELBOURNE.
Absorbed dose to active red bone marrow from diagnostic and therapeutic uses of radiation
[ARL-TR-021] N82-13651
AVIONS MARCEL DASSAULT-BREGUET AVIATION, SAINT-CLOUD (FRANCE).
An acquisition and analysis system for dynamic tests of air inlets N82-13082

B

BALLISTIC RESEARCH LABS., ABERDEEN PROVING GROUND, MD.
Nonlinear waves in rods
[AD-A101333] N82-13447
BATH UNIV. (ENGLAND).
Fatigue testing of fibre composites N82-13280
Monitoring of damage in fibre composites N82-13284
BATTELLE COLUMBUS LABS., OHIO.
Synthetic fuel aromaticity and staged combustion
[DE81-024205] N82-13246
Study of methods for applying and enhancing transfer film coatings of polytetrafluoroethylene (PTEE) to Space Shuttle Main Engine (SSME) High Pressure Oxygen Turbo Pump (HPOTP) bearings
[NASA-CR-161916] N82-13428
BECHTEL POWER CORP., SAN FRANCISCO, CALIF.
Environmental and economic comparison of advanced processes for conversion of coal and biomass into clean energy
[PB81-234239] N82-13256
BOEING COMMERCIAL AIRPLANE CO., SEATTLE, WASH.
Airframe-propulsion system aerodynamic interference predictions at high transonic Mach numbers including off-design engine airflow effects N82-13098
BOEING COMPUTER SERVICES, INC., SEATTLE, WASH.
Intermediate photovoltaic system application experiment operational performance report. Volume 2 for Beverly High School, Beverly, Mass.
[DE82-000811] N82-13532
BOEING MILITARY AIRPLANE DEVELOPMENT, SEATTLE, WASH.
Performance of highly integrated inlets for supersonic aircraft N82-13066
Prediction of subsonic aircraft flows with jet exhaust interactions N82-13096
BOLT, BERANEK, AND NEWMAN, INC., CAMBRIDGE, MASS.
A quasi-Newton procedure for identifying pilot-related parameters of the optimal control model N82-13694
On the internal target model in a tracking task N82-13700
A comparison of head and manual control for a position-control pursuit tracking task N82-13720
Evaluation of HALO deconvolution schemes
[AD-A105125] N82-13878
BONN UNIV. (WEST GERMANY).
Temperature and density of geocoronal helium derived from a rocket-borne He resonance cell experiment
[BMFT-FB-W-80-015] N82-13605
BRIGHAM YOUNG UNIV., PROVO, UTAH.
Proton-induced X-ray emission analysis: A complement to analytical methods used in environmental studies
[DE81-029012] N82-13557
BRITISH AEROSPACE AIRCRAFT GROUP, BRISTOL (ENGLAND).
Effects of intake geometry on circular pitot intake performance at zero and low forward speeds N82-13070
BRITISH AEROSPACE AIRCRAFT GROUP, HERTFORDSHIRE (ENGLAND).
The influence of closed-coupled, rear fuselage mounted nacelles on the design of an advanced high speed wing N82-13092
BRITISH AEROSPACE AIRCRAFT GROUP, PRESTON (ENGLAND).
Development of a miniaturised digital thrust demand unit N82-13055
BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
Cryogenic testing of 100-m superconducting power transmission test facility
[DE81-028331] N82-13517
Have we found Asymptopia: The ultimate form of physical laws?
[DE81-028853] N82-13825
Mechanistic studies of electron exchange kinetics using ab initio
[DE81-026096] N82-13856
BRUNEL UNIV., UXBRIDGE (ENGLAND).
An initial study of the application of the numerical method of characteristics to unsteady flow analysis in partially filled gravity drainage sized pipes
[PB81-229189] N82-13399
BUNDESMINISTERIUM DER VERTEIDIGUNG, BONN (WEST GERMANY).
Experimental and theoretical investigations with laboratory models of phased array antenna
[BMVG-FBWT-79-21] N82-13341
BUREAU OF MINES, AMARILLO, TEX.
An apparatus and procedure for calibrating a water vapor analyzer in the 0.1- to 15-ppm range
[PB81-231185] N82-13413
BUREAU OF MINES, AVONDALE, MD.
Wear properties of electrodeposited titanium diboride coe ings
[PB81-233314] N82-13199
BUREAU OF MINES, PITTSBURGH, PA.
Three Bureau of Mines optical dust probes
[PB81-231441] N82-13412
High-pressure shrouded water sprays for dust control
[PB81-231458] N82-13483
Control of methane by ventilation of shafts during raise drilling
[PB81-234502] N82-13487
Creating a safer environment in US coal mines: The Bureau of Mines Methane Control Program, 1964-79
[PB81-233918] N82-13488
Suppression of coal dust explosion by water barrier in a conveyor belt entry
[PB81-233306] N82-13489
BUREAU OF MINES, ROLLA, MO.
Insoluble anodes for electrowinning zinc and other metals
[PB81-227365] N82-13227
BUREAU OF MINES, TWIN CITIES, MINN.
Benefication with magnetic fluids
[PB81-227126] N82-13485
BURNS AND ROE INDUSTRIAL SERVICES CORP., PARAMUS, N. J.
Low/medium Btu coal gasification assessment program for potential users in New Jersey: Executive summary
[DE81-025475] N82-13247

C

CAE ELECTRONICS LTD., MONTREAL (QUEBEC).
Multi-axis manual controllers: A state-of-the-art report N82-13701
Design and development of a six degree of freedom hand controller N82-13706
CALIFORNIA UNIV., BERKELEY.
Pilot scanning patterns while viewing cockpit displays of traffic information N82-13710
Pupillometry, a bioengineering overview N82-13711

Model simulation studies to clarify the effect on saccadic eye movements of initial condition velocities set by the Vestibular Ocular Reflex (VOR) N82-13712
Benefits of detailed models of muscle activation and mechanics N82-13713

CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Thermal performance of windows having high solar transmittance
[DE81-028872] N82-13524
Program planner's guide to geothermal development in California
[DE82-000700] N82-13527
Infiltration and indoor air quality in energy efficient houses in Eugene, Oregon
[DE82-000971] N82-13561
Infrared vibrational predissociation spectroscopy of small molecular clusters
[DE81-028648] N82-13887
Nuclear slab collision in a relativistic quantum field theory
[DE81-028132] N82-13972

CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
Optical polishing of metals
[DE81-028690] N82-13225
Soviet UCG experience specifically related to field experiments in the United States
[DE81-028642] N82-13244
Ultimate in building energy analysis: DOE-2 and BLAST
[DE81-028703] N82-13263
Formulas for one-dimensional local properties for molecular-dynamics simulations of shock waves
[DE82-000906] N82-13395
Low energy X-ray spectrometer
[DE81-025824] N82-13407
On-board data recorder for hard-target weapons
[DE81-028645] N82-13408
Impedance-match experiments using high intensity lasers
[DE81-025802] N82-13422
Impedance-matching experiments using high-pressure, laser-driven shock waves
[DE81-028732] N82-13423
Welding of austenitic stainless steels for liquid-helium service
[DE81-025602] N82-13429
Design and test of two-step solar oil shale retort
[DE82-000964] N82-13543
User's manuals for DYNA3D and DYNAP: Nonlinear dynamic analysis of solids in three dimensions
[DE81-028360] N82-13772
Solution of single linear tridiagonal systems and vectorization of the ICOG algorithm on the Cray 1
[DE81-025461] N82-13773
Monte Carlo calculations of channeling radiation
[DE81-027655] N82-13818
Positron lifetime and Doppler broadening techniques applied to irradiation damaged silver
[DE81-028688] N82-13854
Role of molecular dynamics on descriptions of shock front processes
[DE81-028687] N82-13857
Beam propagation in the frequency-converted subsystems of Nova and Novette
[DE81-028253] N82-13862
Time dependent recording of images transmitted over optical fibers
[DE81-026599] N82-13889
Electron-cyclotron resonant heated electron distribution functions N82-13920
Shock anomaly and s-d transition in high-pressure lanthanum
[DE81-027659] N82-13948
Electron band theory and high pressure equation of state
[DE81-027436] N82-13955
LLNL 1981: Technical horizons
[DE81-028265] N82-14048

CALIFORNIA UNIV., LOS ANGELES.
The relationship between the acoustic impedance and unsteady flow field near the orifice of a two dimensional Helmholtz resonator in grazing flow N82-13378
Numerical experiments on two-phase liquid-vapor mist transport N82-13402
Asymmetric stress and failure analysis
[DE81-026842] N82-13451
Dynamic analysis of flexible spatial mechanisms and robotic manipulators N82-13460
The trace metal stratigraphy and recent sedimentary history of anthrogenous particulates on the San Pedro Shelf, California N82-13579
A monitor for noninvasive estimation of pulmonary blood flow N82-13656
Pupillometric measurement of operator workload N82-13666
Physiological assessment of operator workload during manual tracking. 1: Pupillary responses N82-13670
Research issues in implementing remote presence in teleoperator control N82-13676
Ion cyclotron resonance heating and its effect on confinement in Tokamaks N82-13896
Spectral functions in quantum chromodynamics and applications N82-13969
Problems in quantum mechanics and gravitation N82-13970
Evolution of close binary systems: Observational aspects
[NASA-CR-165039] N82-14027
Radiatively cooled stellar winds N82-14034

CALIFORNIA UNIV., RIVERSIDE.
An extension to N dimensions of the Von Karman equations N82-13441
Colloidal properties of coagulated calcium-montmorillonite suspensions N82-13609
The least fixed point property for omega chain continuous functions N82-13787

CALIFORNIA UNIV., SANTA CRUZ.
Recurrence intervals and recency of faulting along the San Gregorio fault zone, San Mateo County, California N82-13581
Petrology and geochemistry of ophiolite fragments in a tectonic melange, Kodiak Islands, Alaska N82-13610

CALSPAN ADVANCED TECHNOLOGY CENTER, BUFFALO, N.Y.
Mitigation of biofouling using coatings
[DE81-027900] N82-13647

CAMBRIDGE UNIV. (ENGLAND).
Cyclic compression, combustion and expansion of a fuel and air mixture in a cylinder containing a catalyst
[PB81-232480] N82-13434
Residual stress and deformation in circumferential pipe-joint welds
[PB81-232464] N82-13458

CARL-CRANZ-GESELLSCHAFT E.V., BRUNSWICK (WEST GERMANY).
Taxonomy of the human factors in man machine systems N82-13726

CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
Multi-sensor image registration N82-13755
Assessing probability assessors: Calibration and refinement
[AD-A104174] N82-13815
Transforming contingency tables
[AD-A104182] N82-13821

CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO.
Transient catalytic combustor model
[NASA-CR-165324] N82-13507

CENTRE D'ETUDES ET DE RECHERCHES, TOULOUSE (FRANCE).
Validation, modeling, and computer assisted design program for power converters
[ESTEC/DERA-8/7208] N82-13370

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Monocular vision and tactical flight on the helicopter N82-13059

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, MEUDON (FRANCE).
Underexpanded free jets and their interaction with adjacent surfaces
[LOG-J12276] N82-13385

CHALMERS UNIV. OF TECHNOLOGY, GOTEBORG (SWEDEN).
A sharper estimate of the renewal function
[CTH-MATH-1980-18] N82-13798
Steenrod operations in spectral cohomology theories
[CTH-MATH-1981-06] N82-13802
On general 1 exp p summability methods
[CTH-MATH-1981-07] N82-13803

CINCINNATI UNIV., OHIO.
Metal ion modification of polymeric sulfur nitride, (SN) subx, electrodes and electrochemical reduction of acetylene at a molybdenum modified (SN)sub x electrode N82-13185
An investigation of notch low cycle fatigue life behavior of Rene' 80 at high temperature N82-13214
Substructure of 316 stainless steel pipe weldments N82-13215

CITY COLL. OF THE CITY UNIV. OF NEW YORK.
Have we found Asymptopia: The ultimate form of physical laws?
[DE81-028853] N82-13825

COLLINS RADIO CO., CEDAR RAPIDS, IOWA.
A standard control display unit for multi-aircraft application N82-13054

COMBUSTION ENGINEERING, INC., WINDSOR, CONN.
Low-Btu gasification of coal for electric power generation, phase 1, 2, and 3
[DE81-029482] N82-13248

COMPTROLLER GENERAL OF THE UNITED STATES, WASHINGTON, D.C.
Natural gas plan needed to provide greater protection for high-priority and critical uses
[PB81-228488] N82-13255

COMPUTER SCIENCES CORP., MOUNTAIN VIEW, CALIF.
Visual/motion cue mismatch in a coordinated roll maneuver
[NASA-CR-166259] N82-13664

CONNECTICUT DEPT. OF TRANSPORTATION, WETHERSFIELD.
Construction of a recycled Portland cement concrete pavement
[PB81-233553] N82-13267

CONNECTICUT UNIV., STORRS.
Information and display requirements for aircraft terrain following N82-13695
Modeling human tracking error in several different anti-tank systems N82-13699
Dynamic decision-making in multi-task environments: Theory and experimental results
[AD-A102055] N82-13740

CORNING GLASS WORKS, N.Y.
Single mode optical waveguide design investigation
[AD-A098979] N82-13881

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, PRETORIA (SOUTH AFRICA).
Mini-seminars on machining technology
[PB81-223034] N82-13273

CROUZET AEROSPACE AND SYSTEMS, VALENCE (FRANCE).
Using voice control onboard combat aircraft N82-13056

D

DAYTON UNIV., OHIO.
MAGNA: A finite element program for the materially and geometrically nonlinear analysis of three-dimensional structures subjected to static and transient loading
[AD-A099454] N82-13448

DECISION RESEARCH CORP., EUGENE, OREG.
Calibration of probabilities: The state of the art to 1980
[AD-A101986] N82-13817

DEFENCE RESEARCH ESTABLISHMENT, OTTAWA. (ONTARIO).
SEASAT equator crossing program
[AD-A099442] N82-13156

DEFENCE RESEARCH ESTABLISHMENT VALCARTIER (QUEBEC).
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[AD-A105261] N82-13420
Surface failure of CO2 laser irradiated glass
[AD-A105454] N82-13421

DEFENSE COMMUNICATIONS ENGINEERING CENTER, RESTON, VA.
Fiber optics (optical waveguides) technology: Potential application in the DCS
[AD-A104740] N82-13303
Problems with the multitasking facilities in the ADA programming language
[AD-A105229] N82-13769

DELAWARE UNIV., NEWARK.
Salt removal from brackish water by continuous processes with amphoteric, thermally regenerable ion-exchange resins N82-13202

Design procedures for a commercial scale thermal evaporation system to deposit CdS for solar cell manufacture N82-13551

Electron Beam-Induced Current (EBIC) measurements of heat treated polycrystalline cuprous sulfide/cadimum sulfide solar cells N82-13552

Turbulent transfers in the atmospheric surface layer under varied stability conditions. A laboratory study N82-13586

The propagation of inertial-internal waves in coastal upwelling regions N82-13645

DEPARTMENT OF ENERGY, BARTLESVILLE, OKLA.
Performance characteristics of automotive engines in the United States, third series: 1977 Chrysler 318 CID (5.2L), 2V
[PB81-233025] N82-13435

DEPARTMENT OF ENERGY, MORGANTOWN, W. VA.
High-temperature measurements of alkali levels in an experimental 6-inch AFBC
[DE81-023632] N82-13193

DEPARTMENT OF ENERGY, OAK RIDGE, TENN.
Information resources in the USA on new and renewable energy, a description and directory
[DE81-028867] N82-13522

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, BERLIN (WEST GERMANY).
The influence of pressure waves on measurements of high speed train noise
[DFVLR-FB-81-06] N82-13837

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, BRUNSWICK (WEST GERMANY).
Experimental investigation of a helmet mounted sight/display for helicopter N82-13060

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, COLOGNE (WEST GERMANY).
Fatigue test machines N82-13277

On-line computers in fatigue testing N82-13279

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, GOETTINGEN (WEST GERMANY).
An analytical and experimental study of the steady and unsteady airloads on a wing with oscillating control including a streamlined gap
[DFVLR-FB-81-18] N82-13119

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, HAMBURG (WEST GERMANY).
Results and experience with a small multipurpose tracking simulator N82-13153

DISTRICT OF COLUMBIA UNIV., WASHINGTON, D. C.
The District of Columbia Five-Year Water Resources Research Program Plan, 1982-1987
[PB81-234882] N82-13482

DORNIER-WERKE G.M.B.H., FRIEDRICHSHAFEN (WEST GERMANY).
Structural dynamics: Modified calculations
[BMVG-FBWT-81-1] N82-13457

Development and optimization of hydrogen storage materials using surface analytical techniques
[BMVG-FBWT-80-6] N82-13546

DOUGLAS AIRCRAFT CO., INC., LONG BEACH, CALIF.
Prop-fan integration at cruise speeds N82-13097

Further tests of a model-based scheme for predicting pilot opinion ratings for large commercial transports N82-13687

DREXEL UNIV., PHILADELPHIA, PA.
Rapid cycle casting of steel
[AD-A103567] N82-13260

Anamolous loss in transformer steels N82-13371

DUKE UNIV., DURHAM, N. C.
Application of electrochemistry to biochemical problems N82-13179

Analysis and behavior of structures on discrete tensionless foundations N82-13286

DYNATECH CORP., CAMBRIDGE, MASS.
Biomethanation of biomass pyrolysis gases
[DE82-000238] N82-13541

E

EATON ENGINEERING AND RESEARCH CENTER, SOUTHFIELD, MICH.
The ac propulsion system for an electric vehicle, phase 1
[NASA-CR-165480] N82-13506

ECOLE NATIONALE SUPERIEURE DES TELECOMMUNICATIONS, PARIS (FRANCE).
Adaptive equalization algorithms for a dispersive channel
[ENST-E-80012] N82-13776

Far infrared source classification system
[ENST-E-80005] N82-13891

Experimental study of heterodyne photodetection. Perspectives for applications to optical transmission
[ENST-E-80013] N82-13892

EDGERTON, GERMESHAUSEN AND GRIER, INC., IDAHO FALLS, IDAHO.
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[DE81-027487] N82-13971

EDUCATIONAL TESTING SERVICE, PRINCETON, N. J.
An upper asymptote for the three-parameter logistic item-response model
[AD-A103013] N82-13816

ELECTRIC POWER RESEARCH INST., PALO ALTO, CALIF.
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[DE81-903554] N82-13226

Workshop proceedings: U-bend tube cracking in steam generators
[DE81-903765] N82-13515

EMORY UNIV., ATLANTA, GA.
Rates and mechanisms of chemical weathering in an organic environment at Panolo Mountain, Georgia N82-13615

ENGELHARD INDUSTRIES, INC., EDISON, N.J.
Develop and test fuel cell powered on-site integrated total energy system. Phase 3: Full-scale power plant development
[NASA-CR-165328] N82-13490

ENGINEERING SOCIETIES COMMISSION ON ENERGY, INC., WASHINGTON, D. C.
Barriers to the utilization of synthetic fuels for transportation
[NASA-CR-165517] N82-13243

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.
Metabolism summaries of selected halogenated organic compounds in human and environmental media, a literature survey: First update
[PB81-232811] N82-13655

ENVIRONMENTAL RESEARCH AND TECHNOLOGY, INC., CONCORD, MASS.
Analysis of soil moisture extraction algorithm using data from aircraft experiments
[NASA-CR-166719] N82-13470

ERIA/ECA AUTOMATION, ST. CLOUD (FRANCE).
Study on the implementation of a program for quality control of computer programs, phase 1
[ESA-CR(P)-1444] N82-13780

ERPROBUNGSSTELLE DER BUNDESWEHR, MEPPEN (WEST GERMANY).
Transitional ballistics of hypervelocity projectiles
[BMVG-FBWT-80-1] N82-13163

EUROPEAN SOUTHERN OBSERVATORY, LA SILLA (CHILE).
Observing facilities at the European Southern Observatory (ESO) in Chile for cometary observations N82-14006

EUROPEAN SOUTHERN OBSERVATORY, MUNICH (WEST GERMANY).
Astronomical activities report
[ISSN-0531-4496] N82-14028

EUROPEAN SPACE AGENCY, NOORDWIKJ (NETHERLANDS).
The ESA mission to Comet Halley N82-14025

F

FEDERAL COMPILER TESTING CENTER, FALLS CHURCH, VA.
Digital equipment corporation, PDP-11 COBOL version, 4.1 indexed 1-0 module
[PB81-232415] N82-13747

Sperry Univac ASCII COBOL level 5R2
[PB81-228892] N82-13748

COBOL compiler: Northern Telecom, Inc. NTI COBOL/3
[PB81-226417] N82-13749

FEDERAL COMPILER TESTING CENTER, WASHINGTON, D.C.
Digital Equipment Corporation VAX-11 FORTRAN, version 2
[PB81-232431] N82-13745

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FINNISH METEOROLOGICAL INST., HELSINKI.
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[RR-614.71] N82-13553

Magnetic results from Nurmijaervi Geophysical Observatory 1980, No. 22
[ISBN-951-697-155-5] N82-13590

Three-dimensional mapping of the aurora from digitized all-sky pictures
[REPT-550.388.8] N82-13591

FLORIDA UNIV., GAINESVILLE.
Refinement of a method for determining the induced and profile drag of a finite wing from detailed wake measurements N82-13103

Mathematical model of differential reflectometry for use in the investigation of thin film corrosion products N82-13232

Bipolar conduction with AC excitation N82-13373

Artificial Reefs: Proceedings of a Conference
[PB81-227779] N82-13644

A correlated treatment of bound-continuum transitions within the electron propagator formalism N82-13869

Electric field-enhanced diffusion and electron stimulated desorption of alkali elements from glass surfaces during electron bombardment and Auger electron analysis N82-13961

Transport noise arising from diffusion and bulk or surface generation recombination in semiconductors N82-13963

Optical brightness variations in a sample of nineteen radio-quiet quasi-stellar objects N82-14030

FLUIDYNE ENGINEERING CORP., MINNEAPOLIS, MINN.
Model testing techniques for measuring inlet drag N82-13084

FOM-INSTITUUT VOOR PLASMAFYSICA, RIJNHUIZEN (NETHERLANDS).
On high beta equilibria of plasmas in the quasi-uniform current model: Influence of shaping the plasma cross section and of the second order in the inverse aspect ratio
[REPT-81-131] N82-13927

FORD AEROSPACE AND COMMUNICATIONS CORP., SUNNYVALE, CALIF.
An information processing model for predicting error detection and correction: An analysis of operator performance
[AD-A105079] N82-13733

FOSTER-MILLER ASSOCIATES, INC., WALTHAM, MASS.
Design and development of a reciprocating low-temperature freon expander
[DE81-028609] N82-13392

FRAUNHOFER INST., FREIBURG (WEST GERMANY).
JASPIC-DIP: The digital impedance probe in the JASPIC project
[BMFT-FB-W-80-034] N82-13169

FRAUNHOFER-INST. FUER BETRIEBSFESTIGKEIT, DARMSTADT (WEST GERMANY).
Planning and analysis of a fatigue test programme N82-13276

Variable amplitude fatigue testing N82-13278

FREIE UNIV., BERLIN (WEST GERMANY).
The measurements of fluid shifts and of the tissue compliance along body axis in man
[BMFT-FB-W-80-011] N82-13654

FWG ASSOCIATES, INC., TULLAHOMA, TENN.
Feasibility study of a procedure to detect and warn of low level wind shear
[NASA-CR-3480] N82-13621

G

GALAXY, INC., WASHINGTON, D.C.
Update on Specified European R and D Efforts. Part 1: Appendices
[DE81-026404] N82-13983

GENERAL ATOMIC CO., SAN DIEGO, CALIF.
Kinetic stability analyses in a bumpy cylinder N82-13921

Data management in a fusion energy research experiment
[DE81-027932] N82-13978

GENERAL DYNAMICS/POMONA, CALIF.
Computer aided manual tracking N82-13705

GENERAL ELECTRIC CO., BINGHAMTON, N.Y.
Electronic master monitor and advisory display system test and demonstration report
[AD-A105317] N82-13141

GENERAL ELECTRIC CO., ST. PETERSBURG, FLA.
Evaluation of advanced technologies for power transformers
[DE82-000793] N82-13368

GENERAL MOTORS RESEARCH LABS., WARREN, MICH.
The influence of motion cues on driver-vehicle performance in a simulator N82-13681

GEOLOGICAL SURVEY, ALBANY, N.Y.
Preliminary investigation of a shallow ground-water flow system associated with Connetquot Brook, Long Island, New York
[PB81-228751] N82-13481

GEORGE WASHINGTON UNIV., WASHINGTON, D.C.
Solving multiactivity multifacility capacity-constrained 0-1 assignment problems
[AD-A102583] N82-13796

GEORGIA INST. OF TECH., ATLANTA.
A numerical study of laminar unsteady compressible flow over airfoils N82-13099

An experimental investigation of the turbulent flow in the junction of a flat plate and a body of constant thickness N82-13102

Effects of hygrothermal conditioning on the dynamic behavior of resin matrix composites N82-13172

Preparation, characterization and performance of non-uniform metal catalysts N82-13204

Studies of sample introduction for inductively coupled plasma emission spectrometry N82-13209

Surface-patch techniques for modeling three-dimensional radiating or scattering objects
[AD-A100212] N82-13336

Separate numerical treatment of attached and detached flow regions in general viscous flows N82-13375

Heat pipe startup from the supercritical state N82-13400

Analysis of the development of shallow groundwater supplies by pumping from ponds
[PB81-231904] N82-13476

Distributed and decentralized control in fully distributed processing systems
[AD-A104379] N82-13739

A difference in efficiency between synchronous and asynchronous systems
[AD-A102280] N82-13742

Complexity of communication among asynchronous parallel processes N82-13760

Solution of initial-value problems for some infinite eventually periodic chains of harmonic oscillators N82-13807

Analysis of coupled translational and rotational diffusion using operator calculus N82-13849

Transport properties of gaseous ions N82-13870

GEORGIA UNIV., ATHENS.
Double beam-in-time photoacoustic spectroscopy N82-13180

Theory and calculation of Raman line shapes and excitation profiles near a one photon resonance N82-13866

Fundamental studies of direct current plasmas N82-13895

GRUMMAN AEROSPACE CORP., BETHPAGE, N.Y.
Some effects of Field Of View (FOV) and target size on lateral tracking at hover N82-13672

H

HAMBURG UNIV. (WEST GERMANY).
Behavior of plane panels in ship structures with local initial deflections
[BMVG-FBWT-80-18] N82-13455

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[DE81-027848] N82-13951

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[AD-A102303] N82-13339

HARRY DIAMOND LABS., ADELPHI, MD.
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[AD-A102566] N82-13165

Camelot: A novel concept for a multiterawatt pulse power generator for single pulse burst or repetition rate operation
[AD-A103024] N82-13513

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Progress in the global standarization of gravity: An analysis of the Woollard and Rose international gravity values
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[PB81-231912] N82-13478

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A central microprocessor controlled electrical storage heating system
[BMFT-FB-T-80-182] N82-13547

HOWARD UNIV., WASHINGTON, D. C.
Laboratory measurements of the cometary photochemical phenomena N82-14023

I

IBM WATSON RESEARCH CENTER, YORKTOWN HEIGHTS, N.Y.
Study of the physics of insulating films as related to the reliability of metal-oxide semiconductor devices
[AD-A105030] N82-13359

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Computational problems in autoregressive moving average (ARMA) models N82-13698

Load compensating reactions to perturbations at wrist joint in normal man N82-13708

ILLINOIS UNIV., CHAMPAIGN.
The cognitive demands of second order manual control: Applications of the event related brain potential N82-13667

ILLINOIS UNIV., URBANA.
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[DE81-026618] N82-13836

Defect studies of molecular and rare-gas crystals down to 50mK and up to 150 MPa
[DE81-026617] N82-13949

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Radio observations of comets N82-14002

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[LOG-C4073] N82-13111

INGENIEURBUERO FUER ERGONOMIE, MUNICH (WEST GERMANY).
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[AD-A105775] N82-13136

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[DE81-025452] N82-13191

A comparative study of classical and quantal approaches to thermal and diffusive transport in a dilute atom-diatom binary mixture N82-13868

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[PB81-231938] N82-13479

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Turbulent wake development behind streamlined bodies N82-13104

IRT CORP., SAN DIEGO, CALIF.
Conduction and charge storage in electron irradiated spacecraft insulators
[AD-A104796] N82-13167

J

JAYCOR, ALEXANDRIA, VA.
Stability considerations for light-ion beam transport in Z discharge channels
[AD-A101426] N82-13852

JAYCOR, SAN DIEGO, CALIF.
Microstability of the EBT boundary N82-13919

JET PROPULSION LAB., CALIFORNIA INST. OF TECH., PASADENA.
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[JPL-PUB-81-71] N82-13166

Grafting of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole onto polymers with aliphatic groups. Synthesis and polymerization of 2 (2-hydroxy-5-isopropenylphenyl) 2H-benzotriazole and a new synthesis of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole
[NASA-CR-165016] N82-13171

Microwave attenuation and brightness temperature due to the gaseous atmosphere: A comparison of JPL and CCIR values
[NASA-CR-165027] N82-13300

Modulation/demodulation techniques for satellite communications. Part 1: Background
[NASA-CR-165020] N82-13301

Experimental and analytical investigation of a fluidic power generator
[JPL-PUB-81-100] N82-13386

Space applicable DOE photovoltaic technology: An update
[NASA-CR-165021] N82-13491

Distributed photovoltaic systems: Utility interface issues and their present status
[NASA-CR-165019] N82-13492

A preliminary estimate of future communications traffic for the electric power system
[NASA-CR-165015] N82-13493

Measurement of surface recombination velocity for silicon solar cells using a scanning electron microscope with pulsed beam
[JPL-PUB-81-64] N82-13494

Dish stirling solar receiver combustor test program
[NASA-CR-165017] N82-13495

A Module Experimental Process System Development Unit (MEPSDU)
[NASA-CR-165014] N82-13496

Large area sheet task: Advanced dendritic web growth development
[NASA-CR-165013] N82-13497

Flat-plate solar array project: Experimental process system development unit for producing semiconductor-grade silicon using the silane-to-silicon process
[NASA-CR-165022] N82-13498

Development of technique for AR coating and nickel and copper metallization of solar cells: FPS project, product development
[NASA-CR-165033] N82-13499

Continuous Czochralski growth: Silicon sheet growth development of the large area sheet task of the low cost silicon solar array project
[NASA-CR-165030] N82-13500

High resolution, low cost solar cell contact development
[NASA-CR-165032] N82-13501

Design, fabrication, test, qualification, and price analysis of third generation design solar cell modules
[NASA-CR-165007] N82-13502

Investigation of test methods, material properties, and processes for solar cell encapsulants
[NASA-CR-165031] N82-13503

Proceedings of the Seventeenth Annual Conference on Manual Control
[NASA-CR-165005] N82-13665

Functional structure and dynamics of the human nervous system N82-13692

Experimental results with a six-degree-of-freedom force-reflecting hand controller N82-13707

Voice control of the space shuttle video system N82-13719

A model for the control mode man-computer interface dialogue N82-13722

Survey of standards applicable to a database management system
[NASA-CR-165009] N82-13766

Software design and documentation language: User's guide for SDDL release 4
[NASA-CR-165025] N82-13767

Computer vision
[NASA-CR-165012] N82-13768

Infrared experiments for spaceborne planetary atmospheres research. Full report
[NASA-TM-84414] N82-13876

Infrared experiments for spaceborne planetary atmospheres research. Executive summary
[NASA-TM-84413] N82-13877

Controlled Speed Accessory Drive demonstration program
[NASA-CR-165010] N82-13981

Modern Observational Techniques for Comets
[NASA-CR-165006] N82-13989

Cometary ephemerides - needs and concerns N82-13995

Spectrophotometry of faint comets: The asteroid approach N82-13998

Near perihelion observations of Comet Halley from Shuttle orbiter N82-14021

The International Halley Watch: A program of coordination, cooperation and advocacy N82-14026

JOHNS HOPKINS UNIV., BALTIMORE, MD.

Strong convergence of nearest neighbor regression estimators
[AD-A104479] N82-13794

Error bounds for reconstruction of a function f from a finite sequence (SGN(ft sub i) + x sub i))
[AD-A104477] N82-13795

Ultraviolet spectroscopy of comets using sounding rockets, IUE and Spacelab N82-14009

JOINT PUBLICATIONS RESEARCH SERVICE, ARLINGTON, VA.

Antenna (selected articles)
[AD-A106476] N82-13294

Antenna (Selected Articles)
[AD-A106522] N82-13297

Antenna (selected articles)
[AD-A106523] N82-13304

The formation of radiation patterns of arc antennas N82-13305

Energy characteristics of periodic systems of radiators: Efficiency and output coefficient of power, directive gain, and gain factor N82-13306

Antenna (selected articles)
[AD-B060598] N82-13307

Two-mirror antenna for radio relay communication N82-13308

Use of principle of regularization in direct and mixed problems of the theory of the synthesis of radiating systems N82-13309

Synthesis of a plane system of discrete emitters N82-13310

Antenna (selected articles)
[AD-B060573] N82-13316

Antenna (selected articles)
[AD-A106500] N82-13327

Excitation of radial resonator with annular slot N82-13328

Synthesis of nonequidistant line-source antenna by the statistical methods of search N82-13329

Principles of the construction of systems, which possess potential frequency independence N82-13330

Natural and mutual conductivities of half-wave slots, arbitrarily oriented on the conducting surface of circular cylinder N82-13331

Characteristics of antennas with frequency beam swinging N82-13332

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Mesh generating and plotting facilities of the LAMCAL program
[EUR-7099-EN] N82-13778

Gamma ray buildup factors in lead-iron and iron-lead shields
[EUR-7086-EN] N82-13864

K

KANSAS STATE UNIV., MANHATTAN.

Simultaneous heat and mass transfer in a porous medium N82-13404

Analytical detection of organic species by means of laser-induced multiphoton ionization N82-13646

Descriptive techniques for digital system containing complex hardware components N82-13754

Compiler generation from lambda calculus definitions of programming languages N82-13759

KAYEX CORP., ROCHESTER, N. Y.

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[NASA-CR-165030] N82-13500

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[IPPJ-545] N82-13901

L

LEHIGH UNIV., BETHLEHEM, PA.

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[NASA-CR-165424] N82-13508

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Video framerate, resolution and grayscale tradeoffs for undersea telemanipulator N82-13673

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Multiple man-machine interfaces N82-13682

LOCKHEED ELECTRONICS CO., PLAINFIELD, N. J.

Human supervision and microprocessor control of an optical tracking system N82-13715

LOCKHEED ENGINEERING AND MANAGEMENT SERVICES CO., INC., HOUSTON, TEX.

Simple geometric algorithms to aid in clearance management for robotic mechanisms N82-13680

Structure of the knowledge base for an expert labeling system N82-13723

LOS ALAMOS SCIENTIFIC LAB., N. MEX.

New ways of looking for phase transitions at multi-megabar dynamic pressures
[DE81-028771] N82-13223

Theoretical equations of state for metals
[DE81-028743] N82-13224

Lagrangian fluid dynamics using the Voronoi-Delaunay mesh
[LA-UR-81-1421] N82-13393

Rayleigh-Taylor stability for a shock wave-density discontinuity interaction
[DE81-028707] N82-13394

Impedance-match experiments using high intensity lasers
[DE81-025802] N82-13422

Impedance-matching experiments using high-pressure, laser-driven shock waves
[DE81-028732] N82-13423

Simplified extension of the LSI-11 Q-Bus for a high energy laser control application
[DE81-027001] N82-13424

Pressure measurements of non-planar stress waves
[DE81-028729] N82-13454

Spectra over complex terrain
[DE81-028734] N82-13473

Computer-automated controls for superconducting magnetic energy storage
[DE81-028697] N82-13521

Environmental and radiological safety studies: Interaction of (238) PuO2 heat sources with terrestrial and aquatic environments
[DE81-032019] N82-13565

Application of computer voice input/output
[DE81-028769] N82-13743

PLOT2K: A graphics interface of system 2000
[DE81-028706] N82-13774

Molecular dynamics calculations for sodium using pseudopotential theory
[DE81-029022] N82-13853

Enhanced energy deposition symmetry by hot electron transport
[DE81-028774] N82-13861

Optics of mass separator 1
[DE81-028242] N82-13886

Fiber optic quality assurance at the Nevada Test Site
[DE81-028740] N82-13890

Fiber optic analog and timing monitoring system for the Antares laser fusion program
[DE81-028799] N82-13925

Spectrometric properties of crystals for low-energy X-ray diagnostics
[DE81-028763] N82-13954

Observational data needs useful for modeling the coma N82-13991

Radiation-hydrodynamics of HII regions and molecular clouds
[DE81-028696] N82-14032

LOUISIANA DEPT. OF TRANSPORTATION AND DEVELOPMENT, BATON ROUGE.

Evaluation of reef shell embankment
[PB81-232761] N82-13266

A laboratory evaluation of modified asphalt
[PB81-231615] N82-13269

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[PB81-239311] N82-13574

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Photographic observations of comets at Lowell Observatory N82-14016

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Polymers with mesomorphic organization in the side chains from vinyl monomers with mesogenic or potentially mesogenic elements N82-13234

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Papers presented to the Conference on the Processes of Planetary Rifting
[LPI-CONTRIB-457] N82-13595

M

MARYLAND UNIV., COLLEGE PARK.

On the formal specification of computer communication protocols
[AD-A100189] N82-13738

Introductory remarks: Photometry section N82-13996

Correlated ground-based and the observations N82-14008

MASON AND HANGER-SILAS MASON CO., INC., AMARILLO, TEX.

Evaluation of low-chlorine TATB from a production source
[DE81-025474] N82-13249

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[AD-A103342] N82-13337

Investigation of the acoustic emission and deformation response of finite ice plates
[AD-A103731] N82-13471
Surface signs of internal ocean dynamics
[AD-A101380] N82-13642
Video framerate, resolution and grayscale tradeoffs for undersea telemanipulator N82-13673
Two-D results on human operator perception N82-13697
Preliminary analysis of a breadth-first parsing algorithm: Theoretical and experimental results
[AD-A101852] N82-13797
Investigation of photoacoustorefractive effect in LiNbO sub 3 SAW devices
[AD-A103705] N82-13880

MASSACHUSETTS UNIV., AMHERST.
Grafting of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole onto polymers with aliphatic groups. Synthesis and polymerization of 2 (2-hydroxy-5-isopropenylphenyl) 2H-benzotriazole and a new synthesis of 2 (2-hydroxy-5-vinylphenyl) 2H-benzotriazole
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Massachusetts' five-year water resources research needs, 1982-1987
[PB81-231961] N82-13480

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Anticipated results from dust experiments on cometary missions N82-13993

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[MPIS-MITT-69] N82-13118

MCDONNELL AIRCRAFT CO., ST. LOUIS, MO.
F/A 18 Hornet crew station N82-13064

MCDONNELL-DOUGLAS ASTRONAUTICS CO., HUNTINGTON BEACH, CALIF.
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MECHANICAL TECHNOLOGY, INC., LATHAM, N. Y.
Assessment of rotor-bearing dynamics: A planning study for the utility industry
[DE82-900378] N82-13430

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Increase in the profitability of design and process planning by integrated and graphic data processing, phase 1
[BMFT-FB-W-81-005] N82-13777

MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., MUNICH (WEST GERMANY).
Calculation of transonic air-intakes using a computer package for inviscid and boundary layer flows N82-13072
The design and development of the Tornado engine air intake N82-13074
A calculation method for slender wing-body configurations in supersonic flow at high angles of attack
[BMVG-FBWT-79-15] N82-13115
Final report on the FueFo-4 major theme: Interference drag with airframe/engine integration on fighter aircraft
[BMVG-FBWT-79-20] N82-13116
Contributions to the aerodynamics of wing-body configurations in the nonlinear range of angles of attack
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System identification helicopter parameters. Determination from flight tests, phase 2
[BMVG-FBWT-80-12] N82-13137

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[DE82-900355] N82-13563
Tables of statistical summaries for the SURE aircraft measurements
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Aircraft data summaries for the SURE intensives, volume 1
[DE82-900314] N82-13568
Aircraft data summaries of the SURE intensives, volume 4
[DE82-900311] N82-13569
Aircraft data summaries of the SURE intensives, volume 5
[DE82-900310] N82-13570

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Beyond mere automation
[AD-A103838] N82-13736

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Strain-induced crystallization of polymers N82-13239
Three laser experiments in gases N82-13416

MIDWEST RESEARCH INST., GOLDEN, COLO.
Preparation and characterization of hydrogenated amorphous silicon
[DE81-030973] N82-13197
Electric coheating experiment to determine the heat-loss coefficient of a double-envelope house
[DE81-027937] N82-13264
Appliance efficiency and the solar building
[DE81-029073] N82-13265
Inexpensive thermographic techniques for determining reliable solar-collector-array performance
[DE82-001151] N82-13528
Solar thermal energy systems
[DE81-029295] N82-13531
New and renewable energy in the United States of America
[DE81-030887] N82-13539
Development of high-efficiency cascade solar cells
[DE81-029633] N82-13540

MINNESOTA UNIV., MINNEAPOLIS.
Development of peatlands in northern Minnesota
[DE82-000873] N82-13475
Techniques for energy conservation in ac motor-driven systems
[DE82-900356] N82-13537
Preemptive scheduling of a multiprocessor system with memories to minimize L sub max
[AD-A103795] N82-13734
Parallel scheduling algorithms
[AD-A103796] N82-13820

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE.
Testing and evaluation of MHD materials and substructures
[DE81-024331] N82-13926

MISSOURI UNIV. -ROLLA.
Solubilities in multicomponent systems of nonspecific interactions N82-13205
Molecular interactions in amphiphilic association structures N82-13206
Parametric study of silo-material interaction N82-13259
Optimum Design of Static, Earthquake, and Wind Steel Structures (ODSEWS-2D)
[PB81-232738] N82-13271
Load and resistance factor design of cold-formed steel structural members N82-13464
An investigation of the nickel-cobalt occurrence in the southeast Missouri mining district N82-13613
Boron implanted strontium titanate N82-13939

MONSANTO RESEARCH CORP., DAYTON, OHIO.
High altitude testing of residential wood-fired combustion equipment
[PB81-226151] N82-13575

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Comparison of different nozzle concepts for a reheated turbofan N82-13077

MRC APPLIED PSYCHOLOGY UNIT, CAMBRIDGE (ENGLAND).
The influence of ship motion of manual control skills N82-13703

N

NAGOYA UNIV. (JAPAN).
Energy and momentum deposition to plasmas due to the lower hybrid wave by a finite source
[IPPJ-546] N82-13899
Oxygen transport and line emissions in a tokamak plasma
[IPPJ-544] N82-13900
Toroidal plasma current sustainment by lower hybrid waves in the WT-2 Tokamak
[IPPJ-545] N82-13901
Soft and hard major disruptions in the profile control experiment of the JIPP T-2 Tokamak
[IPPJ-547] N82-13902
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[IPPJ-AM-18] N82-13907

NAGOYA UNIV., TOYOKAWA (JAPAN).
Electromagnetic cyclotron harmonic waves
[IPPJ-536] N82-13903
Plasma focus breeder
[IPPJ-541] N82-13904
Feedback plasma control in hybrid poloidal coil system
[IPPJ-542] N82-13905
Numerical study on the interaction between a modulated electron beam and a plasma
[IPPJ-543] N82-13906
A triggering of solar flare by magnetosonic waves in a neutral sheet plasma
[IPPJ-540] N82-14042

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Top-mounted inlet system feasibility for transonic-subsonic fighter aircraft applications N82-13067
Crossflow effects on steady and fluctuating pressures on an ogive-cylinder cone-frustum model in supersonic separated flow
[NASA-TP-1951] N82-13108
Guidelines for line-oriented flight training, volume 2
[NASA-CP-2184-VOL-2] N82-13123
Issues related to line-oriented flight training N82-13124
Line-oriented flight training: Northwest Airlines N82-13125
United Airlines LOFT training N82-13126
Eastern Airlines LOFT program N82-13127
Texas International Airlines LOFT program N82-13128
Delta Airlines LOFT training N82-13129
American Airlines LOFT evaluation program N82-13130
Group 1: Scenario design and development issues N82-13131
Group 2: Real time LOFT operations N82-13132
Group 3: Performance evaluation and assessment N82-13133
Group 4: Instructor training and qualifications N82-13134
Biological and physical oceanographic observations pertaining to the trawl fishery in a region of persistent coastal upwelling
[NASA-TM-81332] N82-13637
Subjective rating scales as a workload N82-13669
Horizontal conflict resolution maneuvers with a cockpit display of traffic information N82-13671
An analytical approach for predicting pilot induced oscillations N82-13688
The role of manipulator characteristics in selecting the ideal effective vehicle N82-13704

Pilot scanning patterns while viewing cockpit displays of traffic information N82-13710

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. HUGH L. DRYDEN FLIGHT RESEARCH CENTER, EDWARDS, CALIF.

Analysis of a longitudinal pilot-induced oscillation experienced on the approach and landing test of the space shuttle
[NASA-TM-81366] N82-13149

Report on research and technology-FY 1981
[NASA-TM-81367] N82-14047

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Scanner
[NASA-CASE-GSC-12032-2] N82-13465

Interpolating for the location of remote sensor data
[NASA-TM-82169] N82-13469

Magnetic clouds between 2-4 AU: Voyager observations
[NASA-TM-83849] N82-13593

Large-scale variations of the interplanetary magnetic field: Voyager 1 and 2 observations between 1-5 AU
[NASA-TM-83850] N82-13594

Compensation for use of monthly-averaged winds in numerical modeling
[NASA-TM-83855] N82-13623

Observational data needs for plasma phenomena N82-13992

Infrared observations of comets N82-14000

Millimeter wave radiometry as a means of determining cometary surface and subsurface temperature N82-14003

A possible technique for cometary studies with high angular and spectral resolution N82-14012

The JOCR program N82-14013

Narrow passband imagery of comets N82-14014

Existing cometary data and future needs N82-14017

The interactive astronomical data analysis facility - image enhancement techniques to Comet Halley N82-14019

Astronomical data bases and retrieval systems N82-14020

Laboratory Research N82-14022

Plans for Comet Halley N82-14024

Planetary radio astronomy observations from Voyager-2 near Saturn
[NASA-TM-83856] N82-14037

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[NASA-TM-83846] N82-14038

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Voice control of the space shuttle video system N82-13719

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An approximate analytical method for vortex-lift and center of pressure on the slender wing
[NASA-TM-83198] N82-13045

Wind-tunnel investigation of the tail-spoiler concept for stall-prevention on general aviation airplanes
[NASA-TM-83208] N82-13047

Force and moment, flow-visualization, and boundary-layer tests on a shuttle orbiter model at Mach 6
[NASA-TP-1952] N82-13106

Wind-tunnel investigation of the effects of blade tip geometry on the interaction of torsional loads and performance for an articulated helicopter rotor
[NASA-TP-1926] N82-13107

Pressure distributions on three different cruciform aft-tail control surfaces of a wingless missile at Mach 1.60, 2.36, and 3.70. Volume 1: Trapezoidal tail
[NASA-TM-80097] N82-13110

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Limited evaluation of an F-14A airplane utilizing an aileron-rudder interconnect control system in the landing configuration
[NASA-TM-81972] N82-13148

Aerodynamic heating on the corrugated surface of a 10.2 deg half-angle blunted cone at Mach 6.7
[NASA-TP-1928] N82-13383

Large volume multiple-path nuclear pumped laser
[NASA-CASE-LAR-12592-1] N82-13415

Laboratory measurements of physical, chemical, and optical characteristics of Lake Chicot sediment waters
[NASA-TP-1941] N82-13468

SAM 2 measurements of the polar stratospheric aerosol, volume 1: October to April 1979
[NASA-RP-1081] N82-13592

Comparison of data inversion techniques for remotely sensed wide-angle observations of Earth emitted radiation
[NASA-TP-1924] N82-13620

Determination of two-stroke engine exhaust noise by the method of characteristics
[NASA-TM-84061] N82-13827

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.

Thrust modulation methods for a subsonic V/STOL aircraft
[NASA-TM-82747] N82-13112

Computational methods for internal flows with emphasis on turbomachinery
[NASA-TM-82764] N82-13113

The effect of rotor blade thickness and surface finish on the performance of a small axial flow turbine
[NASA-TM-82726] N82-13114

Effect of fuel-air-ratio nonuniformity on emissions of nitrogen oxides
[NASA-TP-1798] N82-13143

A real time Pegasus propulsion system model for VSTOL piloted simulation evaluation
[NASA-TM-82770] N82-13144

NASA research in aircraft propulsion
[NASA-TM-82771] N82-13146

Elevated temperature fatigue testing of metals N82-13281

Catalytic combustion of residual fuels
[NASA-TM-82731] N82-13504

Gas-turbine critical research and advanced technology support project
[NASA-TM-81708] N82-13509

Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-field
[NASA-TM-82750] N82-13908

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.

An improved stress corrosion test medium for aluminum alloys
[NASA-TM-82452] N82-13216

A quantitative study of factors influencing lamellar eutectic morphology during solidification
[NASA-TM-82451] N82-13218

Controlled overspray spray nozzle
[NASA-CASE-MFS-25139-1] N82-13376

Adaptation of the TH Epsilon Mu formalism for the analysis of the equivalence principle in the presence of the weak and electroweak interaction
[NASA-TM-82450] N82-13851

NATIONAL AEROSPACE LAB., AMSTERDAM (NETHERLANDS).

Evaluation of an experimental technique to investigate the effects of the engine position on engine/pylon/wing interference N82-13090

A model of the human observer and decision maker N82-13714

NATIONAL AEROSPACE LAB., TOKYO (JAPAN).

An aerodynamic design and the overall stage performance of an air-cooled axial-flow turbine
[NAL-TR-321T] N82-13109

NATIONAL BUREAU OF STANDARDS, BOULDER, COLO.

Materials studies for magnetic fusion energy applications at low temperatures -4
[PB81-222507] N82-13928

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C.

Review of fire test methods and incident data for portable electric cables in underground coal mines
[PB81-227878] N82-13272

An initial study of the application of the numerical method of characteristics to unsteady flow analysis in partially filled gravity drainage sized pipes
[PB81-229189] N82-13399

Requirements for an effective National Nonionizing Radiation Measurement System
[PB81-223455] N82-13414

Passive/hybrid solar components: An approach to standard thermal test methods
[PB81-227886] N82-13549

Computer science and technology: NBS Programming Environment Workshop report
[PB81-237869] N82-13744

Pedestrian movement characteristics on building ramps
[PB81-229163] N82-13988

NATIONAL DEFENCE HEADQUARTERS, OTTAWA (ONTARIO).

Compressor stall inducing installation effects of an engine control parameter for the CF-5 aircraft N82-13085

NATIONAL GAS TURBINE ESTABLISHMENT, PYESTOCK (ENGLAND).

Prediction and measurement of time-variant, three-dimensional flows in military aircraft intakes N82-13069

NATIONAL GEODETIC SURVEY, ROCKVILLE, MD.

Report of survey for McDonald Observatory, Harvard Radio Astronomy Station, and vicinity
[PB81-234338] N82-13606

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLO.

Environmental effects of pollutants from coal combustion. 1: The Four Corners Power Plant, Farmington, N.M.
[PB81-230427] N82-13572

Environmental effects of pollutants from coal combustion. 2: The Colstrip, Montana Power Plant
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Environmental assessment of the Alaskan Continental Shelf: Annual reports of principal investigators for the year ending March 1980. Volume 5: Hazards
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Hawaii Mesoscale Energy and Climate project (HAMEC). 3: Atmospheric aerosol and cloud microphysics measurements
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Solar-geophysical data. Prompt report, part 1
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Solar-geophysical data. Comprehensive reports, part 2
[PB81-221186] N82-14045

Solar-geophysical data. Explanation of data reports
[PB81-221194] N82-14046

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, ROCKVILLE, MD.

Deep Ocean Mining Environmental Study. Environmental effects of commercial-scale mining
[PB81-227753] N82-13484

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, SILVER SPRING, MD.

Atmospheric dispersion forecasts at selected locations in the United States
[PB81-230443] N82-13635

NATIONAL RESEARCH COUNCIL OF CANADA, OTTAWA (ONTARIO).

Compressor stall inducing installation effects of an engine control parameter for the CF-5 aircraft N82-13085

Constitution of silicate anions in tetraethyl-ammonium silicates and their aqueous solutions
[NRC/CNR-TT-2004] N82-13170

NATIONAL SEVERE STORMS LAB., NORMAN, OKLA.

Spring program summary, 1980
[PB81-234940] N82-13628

NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION, BOULDER, COLO.
Effects of the Satellite Power System on low Earth orbit and geosynchronous satellites
[PB81-232019] N82-13157
NATIONAL WEATHER SERVICE, HONOLULU, HAWAII.
Some mean characteristics of Central North Pacific tropical cyclones
[PB81-230492] N82-13634
NATIONAL WEATHER SERVICE, SALT LAKE CITY, UTAH.
Annual data and verification tabulation, eastern North Pacific tropical storms and hurricanes 1980
[PB81-230336] N82-13636
NATIONAL WEATHER SERVICE, SILVER SPRING, MD.
National Weather Service public forecast verification
[PB81-231714] N82-13632
NAVAL AIR DEVELOPMENT CENTER, WARMINSTER, PA.
The intelligent use of intelligent systems: Problems in engineering man/machine symbiosis N82-13058
NAVAL AIR TEST CENTER, PATUXENT RIVER, MD.
Evaluation of a pilot workload assessment device to test alternate display formats and control handling qualities N82-13062
NAVAL BIODYNAMICS LAB., NEW ORLEANS, LA.
Determination of efficient methods of lift by comparing trained and untrained male and female lifters
[AD-A100349] N82-13650
NAVAL CIVIL ENGINEERING LAB., PORT HUENEME, CALIF.
Computer program for optimum nonlinear dynamic design of reinforced concrete slabs under blast loading (CBARCS)
[AD-A104253] N82-13262
NAVAL OCEAN SYSTEMS CENTER, SAN DIEGO, CALIF.
Future directions in Navy electronic system reliability and survivability
[AD-A102460] N82-13438
Digital data compression algorithm performance comparisions: Proposed NATO standard algorithm provides better facsimile in a noisy communications environment than present Tactical Digital Facsimile algorithm
[AD-A103159] N82-13737
NAVAL OCEANOGRAPHIC OFFICE, BAY ST. LOUIS, MISS.
ICAPS oceanographic data for the Indian Ocean
[AD-A103173] N82-13641
NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
The message processing and distribution system development
[AD-A104585] N82-13333
Flow characteristics of a multiple nozzle exhaust gas eductor system
[AD-A104072] N82-13387
Ecology and distribution of the Benthic community on the Monterey Breakwater, Monterey, California
[AD-A102047] N82-13555
Laboratory study of sound propagation into a fast bottom medium
[AD-A104596] N82-13831
Acoustic boundary wave generation and shadowing at a seamount
[AD-A104594] N82-13832
Compilation of abstracts of dissertations theses, and research papers submitted by candidates for degrees, 1 October 1979 - 30 September 1980
[AD-A104124] N82-13974
A summary of the Naval Postgraduate School Research Program
[AD-A104112] N82-13975
NAVAL RESEARCH LAB., WASHINGTON, D. C.
Preliminary evaluation of ion implantation as a surface treatment to reduce wear of tool bits
[AD-A105053] N82-13261
Atmospheric 222Rn measurements at San Nicolas Island during 1980
[AD-A104802] N82-13602
Stability considerations for light-ion beam transport in Z discharge channels
[AD-A101426] N82-13852
NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD.
Playbk-routines to drive a digital-to-analog converter
[AD-A102049] N82-13741
NAVAL SURFACE WEAPONS CENTER, WHITE OAK, MD.
Magnetically undetectable electronic circuit assemblies
[AD-A100669] N82-13358
Explosive-metal composites and electrical switch technology
[AD-A099476] N82-13361
Hydrodynamic computations of pressures generated by steam pipe rupture
[AD-A102046] N82-13449
NAVAL WEAPONS CENTER, CHINA LAKE, CALIF.
Preparation and characterization of hydrogenated amorphous silicon
[DE81-030973] N82-13197
NEBRASKA UNIV. - LINCOLN.
An integral equation method for cutout problems in shells N82-13459
Interatomic potential energy hypersurfaces for molecules N82-13841
Schwinger's variational principle for electron-ion scattering N82-13844
The growth and carrier transport properties of sputter deposited GaAs thin films doped with silicon and magnesium N82-13965
NELSON AND JOHNSON ENGINEERING, INC., BOULDER, COLO.
Simplified extension of the LSI-11 Q-Bus for a high energy laser control application
[DE81-027001] N82-13424
NEVADA UNIV., RENO.
Experimental determination of the effect of physical properties on the drag of liquid drops N82-13380
NEW ENGLAND RESEARCH CENTER, SUDBURY, MASS.
HgCdTe fabrication using directed energy techniques
[AD-A105626] N82-13947
NEW MEXICO UNIV., ALBUQUERQUE.
Estimation of variable latency signals via unwrapped phase averaging with application to visual evoked potentials N82-13347
Supervisory control of remote manipulation: A preliminary evaluation N82-13675
Observation of high field DHVA effect and induced magnetism in single crystal TiBe sub 2
[DE81-025292] N82-13950
NIELSEN ENGINEERING AND RESEARCH, INC., MOUNTAIN VIEW, CALIF.
Consolidation of data base for Army generalized missile model
[NASA-CR-166273] N82-13046
NORTH CAROLINA STATE UNIV. AT RALEIGH.
Effect of solvents on the radiation-induced polymerization of ethyl and isopropyl vinyl ethers N82-13238
An experimental study of turbulence in an urban environment N82-13618
Double differential continuum neutron scattering cross sections in iron and nickel for incident energies of 7.5, 10 and 12 MeV N82-13847
NORTH CAROLINA STATE UNIV., RALEIGH.
Development of high-efficiency cascade solar cells
[DE81-029633] N82-13540
NORTHEASTERN UNIV., BOSTON, MASS.
Linguistic and human performance considerations in the design of an anticipatory communication aid N82-13657
NORTHROP CORP., HAWTHORNE, CALIF.
Top-mounted inlet system feasibility for transonic-subsonic fighter aircraft applications N82-13067
NORTHWESTERN UNIV., EVANSTON, ILL.
Surface enhanced Raman spectroscopy for interfacial characterization N82-13175
Resonance Raman spectroscopic investigations of the active site structures of hemoglobin and hemerythrin N82-13176
A study of the formation and structure of small clusters of noble gases and sulfur hexafluoride formed in Laval Nozzle molecular beams N82-13201
Cyclic deformation and fatigue crack initiation of a coherently precipitating Ni-14.4 at % Al alloy N82-13212
Fatigue crack propagation studies in two cryogenic steels N82-13213
Cyclic deformation and fatigue microcrack initiation in pearlitic eutectoid steel N82-13230
Deformation-enhanced photoemission from metals N82-13231
A study of the dynamic and transient properties of polymer solutions N82-13241
Effective stress-strain-strength behavior of silicate-grouted sand N82-13257
Injection and distribution of silicate grout in sand N82-13287
Short-range communications using diffusely scattered infrared radiation N82-13344
Conductivity and permittivity measurements of fast ion conductors in the microwave region N82-13351
Energetics and dynamics of droplet evaporation in high temperature intermediate Reynolds number flows N82-13379
Numerical methods for the analysis of fluid-structure interaction problems N82-13381
Thermoelastic instability in a seal-like configuration N82-13436
Dynamic effects on fracture of elastic - plastic materials N82-13463
Thermal contraction and flexure of intracratonic basins: A three dimensional study of the Michigan Basin N82-13582
Plastic flow and unstable deformation of geological materials N82-13587
The effects of atmospheric turbulence on the atmospheric transmittance at optical frequencies N82-13608
The nitrogen cycle and heat budget of a subtropical lagoon, Devils Hole, Harrington Sound, Bermuda: Implications for nitrous oxide production and consumption in marine environments N82-13611
Application of Bayesian analysis for wind energy site evaluation N82-13619
Dynamic measurement of human vertical fusional response N82-13660
An integrated approach for the specification and the design of the conceptual level in database systems N82-13730
An approach for numerical database management N82-13731
Probabilistic error analysis of floating point and CRD arithmetics N82-13758
An algebraic model of fault masking logic N82-13804
Some small sample non-parametric space-time clustering tests N82-13811
On the relationship between analytical regularization and regularization by surgery N82-13823
Physical adsorption of quantum atomic and molecular systems N82-13846
Inclusive charged particle spectrum from the interaction of nuclei with intermediate energy proton N82-13848
On the vibrational energy transfer processes of polyatomic molecules in the gas and solid phases N82-13865
Local density studies of electronic structure and bonding in transition metal compounds N82-13936
Nonlinear optical effects in liquid crystals N82-13937
Phase separation of a two component electron-hole liquid in (111) stressed Ge N82-13938
Defect structure and properties of intermetallic compound beta-LiAl N82-13959
A stochastic Langevin dynamics study of correlated ionic motion in one-dimensonal framework solid electrolytes N82-13966
NORWEGIAN DEFENCE RESEARCH ESTABLISHMENT, KJELLER.
High latitude measurements of the Total Electron Content (TEC) using the Faraday technique and comparisons with TEC estimates from NAVSTAR-GPS data
[AD-A103042] N82-13603

O

OAK RIDGE ASSOCIATED UNIVERSITIES, TENN.
Biomass energy systems: Descriptions and employment requirements for typical operations
[DE82-000236] N82-13538

Response of the oceans to increasing atmospheric carbon dioxide
[DE81-028178] N82-13558
Identification of cognitive factors related to remote work performance using closed circuit TV displays N82-13679

OAK RIDGE NATIONAL LAB., TENN.
Studies of photoionization in liquids using a laser two-photon ionization conductivity technique
[DE81-026514] N82-13194
Effect of low-temperature irradiation with (n, alpha) helium production on tensile properties of 12 Cr-1 Mo VW-type steels
[DE81-028578] N82-13222
H-Coal product physical properties measurement
[DE81-029095] N82-13245
DC dielectric strengths of fluorinated benzenes and the stored-energy theory
[DE81-026515] N82-13516
Annual cycle energy system experimental performance and national applicability
[DE81-028570] N82-13523
Building a consensus about energy technologies
[DE82-000501] N82-13536
Concentration of organic compounds in water: A literature survey
[DE81-026517] N82-13556
Control of hydrocarbons and carbon monoxide via catalytic incineration
[DE82-000508] N82-13560
Health and safety research division
[DE81-026088] N82-13652
Man/machine interface development for the REMOTEX concept N82-13678
Assessment of the computer code COBRA/CFTL
[DE81-027933] N82-13771
Background fitting for electron energy-loss spectra
[DE81-027117] N82-13855
Energy losses and mean free paths of electrons in silicon dioxide
[DE81-026353] N82-13860
Specific gamma-ray dose constants for nuclides important to dosimetry and radiological assessment
[DE81-031980] N82-13863
High-temperature gas-cooled reactor technology development program
[DE81-029096] N82-13871
HETFIS: High-energy nucleon-meson transport code with fission
[DE81-027674] N82-13873
EBT Stability Theory: Proceedings of the workshop
[DE81-030635] N82-13909
Review of recent EBT coupled ring-core stability theory N82-13911
Brief survey of experimental investigation of instabilities in microwave-heated plasmas N82-13912
Fluctuation measurements in EBT N82-13913
Numerical solutions of the EBT Radial eigenmode problem N82-13916
Stability of hot electron plasma in the ELMO bumpy torus N82-13917
Effect of Beta limits on reactor performance in EBT N82-13922
Role of electron swarm studies in the development of gaseous dielectrics
[DE81-026349] N82-13952
Effects of pressure on the mixed valent properties of Ce and its intermetallic compounds
[DE81-028572] N82-13953
Separations Science data base: An abstractor's manual
[DE81-029101] N82-13977

OBSERVATOIRE DE PARIS-MEUDON (FRANCE).
Planetary radio astronomy observations from Voyager-2 near Saturn
[NASA-TM-83856] N82-14037

OCCIDENTAL RESEARCH CORP., IRVINE, CALIF.
Controlled-flash pyrolysis
[DE82-000284] N82-13196

OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS (FRANCE).
Wind tunnel tests of powered models: A comparison of two methods of simulating the jets of jet engines N82-13087
Studies of air inlets at Reynolds numbers comparable to flight in ONERA's F1 and S1MA wind tunnels N82-13091
A solution of the Navier-Stokes equations by a mixed finite element method
[ONERA-NT-1981-1] N82-13398

OHIO STATE UNIV., CLEVELAND.
A digital TV system for the detection of high speed human motion N82-13289
High frequency scattering from multiple finite elliptic cylinders N82-13291
Numerical study of multicellular natural convection in vertical cavities N82-13403
System design of the distributed Loop Data Base System (BLDBS) N82-13729
An investigation of some magnetic properties of calcium substituted yttrium iron garnet films N82-13935

OHIO STATE UNIV., COLUMBUS.
Fatigue crack initiation and electrochemical behavior of 403 stainless steel in aqueous environments N82-13210
Stress corrosion cracking of type 304 stainless steel in high temperature dilute chloride solution N82-13228
Geometric programming for engineering design optimization N82-13288
A hybrid method which combines a moment method current with an asymptotic current
[AD-A102199] N82-13340
Simulation studies on the computation of the gravity vector in space from surface data considering the topography of the Earth N82-13612
An investigation into pilot and system response to critical in-flight events, volume 1
[NASA-CR-166243-VOL-1] N82-13662
An investigation into pilot and system response to critical in-flight events, volume 2
[NASA-CR-166243-VOL-2] N82-13663
Design of a real time, interactive, parallel simulation computer N82-13781
Pattern of neutrino mixing in grand unified theories
[DE81-029034] N82-13872
The transfer of polarized radiation in spectral lines from rotationally distorted stars N82-14031
An investigation of warm carbon stars N82-14033

OKLAHOMA STATE UNIV., STILLWATER.
A method for accelerating convergence to the solution of nonlinear structural equations by reducing residual work N82-13439
Computer implementation of optimal multivariable controller design in the frequency domain N82-13785
A stochastic extension of the structural properties of compartment models via a Kronecker algebra N82-13810

OLD DOMINION UNIV., NORFOLK, VA.
Propagation of sound through the Earth's atmosphere
[NASA-CR-165008] N82-13828
Measurement of sound absorption in the air N82-13829
Detection of infrasound generated by Clear Air Turbulence (CAT) N82-13830

OPERATIONS RESEARCH, INC., BETHESDA, MD.
A model for the submarine depthkeeping team N82-13689

OREGON STATE UNIV., CORVALLIS.
An experimental study of heat transfer to a horizontal tube in a large particle fluidized bed at elevated temperature N82-13406
Network wind power over the Pacific northwest. Appendix 1: Wind statistics summaries for the wind power data stations
[DE81-029291] N82-13518
Wind Power: Research on network wind power over the Pacific northwest. Executive summary
[DE81-029360] N82-13519

P

PACIFIC NORTHWEST LAB., RICHLAND, WASH.
Development of the high-temperature redox electrode and improved corrosion rate meter
[DE82-000933] N82-13409
Technology assessment of solar energy systems: Availability and impacts of woody biomass utilization in the Pacific Northwest
[DE82-000705] N82-13535
Treatment of biomass gasification wastewaters using reverse osmosis
[DE82-000698] N82-13566
Treatment of biomass-gasification wastewaters by wet-air oxidation
[DE82-000935] N82-13567
Numerical wind-speed simulation model
[DE82-000956] N82-13627

PARAGON PACIFIC, INC., EL SEGUNDO, CALIF.
Development report: Automatic System Test and Calibration (ASTAC) equipment
[NASA-CR-165403] N82-13505

PARIS XII UNIV., EVRY (FRANCE).
The persistence of a visual dominance effect in a telemanipulator task: A comparison between visual and electrotactile feedback N82-13677

PAU UNIV. (FRANCE).
Microemulsions, emulsions and related systems: Energy applications N82-13545

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Aircraft measurements and mathematical modeling of the removal of gaseous air pollutants at natural air-land and air-water interfaces N82-13577
Outer-shell excitation in sputtered atoms N82-13839

PENNSYLVANIA UNIV., PHILADELPHIA.
Basement rocks of the main interior basins of the midcontinent
[NASA-CR-164935] N82-13596
The structure and properties of grain boundaries N82-13962

PERCEPTRONICS, INC., WOODLAND HILLS, CALIF.
Decision aids for airborne intercept operations in advanced aircrafts N82-13683

PHOTOWATT INTERNATIONAL, INC., TEMPE, ARIZ.
Development of technique for AR coating and nickel and copper metallization of solar cells: FPS project, product development
[NASA-CR-165033] N82-13499

PITTSBURG UNIV., PA.
Investigation into the role of NaCl deposited on oxide and metal substrates in the initiation of hot corrosion
[NASA-CR-165029] N82-13217
Water and energy usage in coal preparation
[PB81-238248] N82-13486

POLYTECHNIC INST. OF NEW YORK, BROOKLYN.
Potential use of the minicomputer controlled powder diffractometer for the structure determination of small quantities of rather impure materials N82-13207
Studies of polymer compatibility by nonradiative energy transfer N82-13235
Flammability and photo-stability of selected polymer systems N82-13236
Ionospheric scintillation N82-13585
Some experimental design techniques in image processing problems N82-13782
A contribution to robust detection and estimation N82-13809

PRATT AND WHITNEY AIRCRAFT GROUP, EAST HARTFORD, CONN.
Sensor failure detection system
[NASA-CR-165515] N82-13145

PRINCETON UNIV., N. J.
Analytical theory of interchange and compressional Alfven instabilities in EBT N82-13918
Enhanced-confinement class of stellarators
[DE81-028727] N82-13924

PUBLIC SERVICE CO. OF INDIANA, PLAINFIELD.
Compressed air energy storage: Preliminary design and site development program in an aquifer. Volume 2: Utility system planning
[DE82-000466] N82-13544

PURDUE UNIV., LAFAYETTE, IND.
An experimental study of Tollmien-Schlichting wave cancellation N82-13120
Interactive aircraft flight control and aeroelastic stabilization
[NASA-CR-165036] N82-13150
Control design for parameter sensitivity reduction in linear regulators: Application to large flexible space structures N82-13158
Gas turbine combustor soot and radiation N82-13174
The effects of added softening agents upon the behavior of cold recycled asphalt mixtures
[PB81-231417] N82-13268
Digital video bandwidth compression systems employing block truncation coding N82-13290

Application of the method of weighted residuals to the boundary layer momentum and turbulent stress transport equations N82-13374
Application of a gravity-driven wickless heat pipe for ice production in a cold energy storage system N82-13377
Computation of unsteady two-dimensional inviscid flow in turbomachinery cascades N82-13401
Measured pavement response to transient aircraft loadings N82-13442
An experimental study of a reinforced concrete folded plate structure with edge beams N82-13443
Analysis of steel beam-to-column moment connections N82-13444
Elastic-plastic-fracture analysis of concrete structures N82-13462
On the use of the OCM's quadratic objective function as a pilot rating metric N82-13693
An analytical study of multiprocessor system reliability N82-13728
Introduction to the configurable highly parallel computer, revision
[AD-A099776] N82-13735
A mixed variational principle for finite element analysis N82-13789
A Bayesian approach to the symmetric multiple comparisons problem in the two-way balanced design N82-13819
Transition radiation as an X-ray source N82-13840
Critically evaluated data on optical and transport properties of solids (refractive index and absorption coefficient of selected optical materials)
[AD-A105059] N82-13879
The structural and vibrational properties of amorphous and crystalline group V elements N82-13933
Raman probe of equilibrium and laser modulated populations of electrons and phonons in GaAs N82-13934
Compton scattering in a uniform, constant magnetic field N82-13968

R

R AND D ASSOCIATES, MARINA DEL REY, CALIF.
Modeling of turbulent mixing at density discontinuities in nonsteady compressible flows
[AD-A105564] N82-13391
RADIOPHYSICS, INC., BOULDER, COLO.
Planetary radio astronomy observations from Voyager-2 near Saturn
[NASA-TM-83856] N82-14037
RAND CORP., SANTA MONICA, CALIF.
A new approach to modeling the cost of ownership for aircraft systems
[AD-A104434] N82-13979
The evaluation of technology R&D: A continuing Dilemma
[RAND/P-6655] N82-13980
RAYTHEON CO., BEDFORD, MASS.
Design and fabricate a CCD analog multiplier
[AD-A105557] N82-13364
RENSSELAER POLYTECHNIC INST., TROY, N. Y.
Spectroelectrochemistry, flash photolysis and photogalvanic effect of methylene blue and safranin-0 N82-13208
RESEARCH INST. OF NATIONAL DEFENCE, LINKOEPING (SWEDEN).
Environment simulator for radar signals on the digital level
[FOA-A-30025-E4] N82-13343
RESEARCH INST. OF NATIONAL DEFENCE, STOCKHOLM (SWEDEN).
Test number 2 of propellants for rocket motor E573
[FOA-C-20411-D1] N82-13254
Testing of a work bench for handling of explosives in the laboratory
[FOA-C-20393-D1] N82-13397
FOA 27 control instruments data system. Control instruments and their functions
[FOA-C-20394-D3] N82-13410
International seismological data center. Input data for an experimental data base
[FOA-C-20380-T1] N82-13604
A comparison of three programs for the calculation of surface-ratio
[FOA-C-20392-D8] N82-13779
RESEARCH TRIANGLE INST., RESEARCH TRIANGLE PARK, N. C.
Development of high-efficiency cascade solar cells
[DE81-029633] N82-13540
Aircraft data summaries for the SURE intensives, volume 6
[DE82-900355] N82-13563
Aircraft data summaries for the SURE intensives, volume 1
[DE82-900314] N82-13568
Aircraft data summaries of the SURE intensives, volume 4
[DE82-900311] N82-13569
Aircraft data summaries of the SURE intensives, volume 5
[DE82-900310] N82-13570
Environmental hazard rankings of pollutants generated in coal gasification processes
[PB81-231698] N82-13576
ROCHESTER UNIV., N. Y.
Investigation of fluctuation phenomena in dye lasers N82-13419
A specification and proof technique for message-based systems and its application to distributed database algorithms N82-13756
Language, computation, and reality N82-13757
The existence of nonzero maps from injectives to projectives N82-13808
Curvature singularities in certain space-times N82-13824
Molecular beam electric resonance studies of weakly bound complexes N82-13867
Inelastic scattering of high energy muons from nuclear targets N82-13874
Phase measurments in the focal region of an aberrated lens N82-13875
Push-pull fatigue of LiF and MgO single crystals N82-13960
New exact and asymptotic solutions of the stationary vacuum Einstein equations N82-13973
ROCKWELL INTERNATIONAL CORP., COLUMBUS, OHIO.
Investigation of acoustic interactions in jet thrust augmenting ejectors
[AD-A106083] N82-13835
ROCKWELL INTERNATIONAL CORP., GOLDEN, COLO.
Dynamic mass spectrometry: A residual gas analysis method and some applications
[DE81-026230] N82-13195
ROCKWELL INTERNATIONAL SCIENCE CENTER, THOUSAND OAKS, CALIF.
Laser heat treatment of track components in combat vehicles, phase 1
[AD-A102761] N82-13219
Mechanisms by which humidity alters ductility
[AD-A105530] N82-13221
ROLLS-ROYCE LTD., BRISTOL (ENGLAND).
The subsonic performance of practical military variable area convergent nozzles N82-13076
ROLLS-ROYCE LTD., DERBY (ENGLAND).
Establishment of an experimental technique to provide accurate measurement of the installed drag of close coupled civil nacelle/airframe configurations, using a full span model with turbine powered engine simulators N82-13089
ROYAL AIRCRAFT ESTABLISHMENT, BEDFORD (ENGLAND).
Some RAE research on shielded and unshielded fuselage mounted air intakes at subsonic and supersonic speeds N82-13068
ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH (ENGLAND).
Use of a helmet-mounted matrix display for presenting energy-maneuverability information during simulated close combat N82-13061
The role of fatigue testing N82-13275
Fatigue tests with a corrosive environment N82-13282
Methods of obtaining crack growth data in metals N82-13283
ROYAL INST. OF TECH., STOCKHOLM (SWEDEN).
High order approximations to Eigensolutions of Sturm-Liouville problems by deferred corrections
[TRITA-NA-8104] N82-13800
Pointwise error estimation for finite element discretizations, part 1
[TRITA-NA-8105-PT-1] N82-13801
ROYAL NETHERLANDS AIRCRAFT FACTORIES FOKKER, SCHIPHOL-OOST.
Aerodynamic aspects of a high bypass ratio engine installation on a fuselage afterbody N82-13093
RUHR UNIV., BOCHUM (WEST GERMANY).
Results to be expected from light scattering dust analyzer during a rendezvous mission N82-13999
RUSH MEDICAL CENTER, CHICAGO, ILL.
Computational problems in autoregressive moving average (ARMA) models N82-13698
RUSH MEDICAL COLL., CHICAGO, ILL.
Load compensating reactions to perturbations at wrist joint in normal man N82-13708
RUTGERS - THE STATE UNIV., PISCATAWAY, N. J.
Generation of orthogonal and nearly orthogonal boundary-fitted coordinates with direct control of grid spacing
[LOG-J12610] N82-13790

S

SACLANT ASW RESEARCH CENTER, LA SPEZIA (ITALY).
The SACLANTCEN oceanographic data base. Volume 1: Design criteria and data structure and content
[AD-A103277] N82-13639
A review of one-dimensional oceanic mixed-layer models
[AD-A103279] N82-13640
SAN JOSE STATE UNIV., CALIF.
Development and testing of dry chemicals in advanced extinguishing systems for jet engine nacelle fires
[NASA-CR-165011] N82-13186
SANDIA LABS., ALBUQUERQUE, N. MEX.
Properties of matter at ultra-high pressures
[DE81-026504] N82-13190
Review of low-voltage CP detonators
[DE81-025837] N82-13250
Performance of chemical analogs of the explosive CP
[DE81-025836] N82-13251
Photon-electron correlation in the laboratory testing of electronic components. Part 2: Beam conditioning and diagnostics
[DE81-026606] N82-13365
Effect of gate oxide thickness on the radiation hardness of silicon-gate CMOS
[DE81-027202] N82-13366
Application of the theory of linear elastic materials with voids
[DE81-027903] N82-13452
Analysis of stress drop in multistage creep experiments: Predictions of exponential creep law
[DE81-029279] N82-13453
Geothermal-resource verification for Air Force Bases
[DE81-027482] N82-13520
Intermediate photovoltaic system application experiment operational performance report. Volume 2 for Beverly High School, Beverly, Mass.
[DE82-000811] N82-13532
MERLIN: A computer program to transfer finite-element meshes
[DE82-000806] N82-13775
Electrooptic shutter devices utilizing PLZT ceramic wafers
[DE81-025470] N82-13885
Minimum/constant voltage PLZT electrooptic shutters
[DE81-028646] N82-13888
Fundamental studies of grain-boundary passivation in polycrystalline silicon with application to improved photovoltaic devices
[DE82-000825] N82-13956
SANDIA LABS., LIVERMORE, CALIF.
Evaluation of creep-fatigue life-prediction models for the solar central receiver
[DE82-000942] N82-13529
Solar-central-receiver fuels and chemicals
[DE82-000941] N82-13530
SANTA BARBARA RESEARCH CENTER, GOLETA, CALIF.
Advanced indium antimonide monolithic charge coupled infrared imaging arrays
[NASA-CR-165799] N82-13356
Scanner
[NASA-CASE-GSC-12032-2] N82-13465

SCI SYSTEMS, INC., HUNTSVILLE, ALA.
Techniques for interfacing multiplex systems
[AD-A101457] N82-13135
SCIENCE APPLICATIONS, INC., MCLEAN, VA.
Mixed layer depth distributions from SVSTD data
[AD-A105669] N82-13834
SCIENCE APPLICATIONS, INC., SAN DIEGO, CALIF.
Optical scanner system for internal inspection of steam-generator tubes
[EPRI-NP-1944] N82-13884
SERVICE DE LA PROGRAMMATION DE LA POLITIQUE SCIENTIFIQUE, BRUSSELS (BELGIUM).
National Research and Development Program: Environmental air. Summary N82-13571
SETON HALL UNIV., SOUTH ORANGE, N. J.
Surface characterization of dispersed supported metal catalysts using a 'time lapse' dynamic pulse technique N82-13177
Gas-solid chromatography on cation forms of lightly sulfonated porous polymers N82-13237
SIEMENS A.G., MUNICH (WEST GERMANY).
Further developments in integrated circuit assembling technology
[BMFT-FB-T-80-179] N82-13369
Multifunctions - liquid crystal displays
[BMFT-FB-T-80-181] N82-13957
SIERRA GEOPHYSICS, INC., ARCADIA, CALIF.
Time domain waveform inversion of short-period p-waves for nuclear explosion source time functions
[AD-A101123] N82-13598
SMITH (WILBUR) AND ASSOCIATES, NEW YORK.
Measures of effectiveness of transportation systems management
[PB81-233884] N82-13984
SMITHS INDUSTRIES LTD., BISHOPS CLEEVE (ENGLAND).
Electronic flight deck displays for military transport aircraft N82-13050
Command-response data transmision to mechanical systems management effect on the crew/system interface N82-13057
SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MASS.
On observing comets for nuclear rotation N82-14015
Astrometric observations of comets and asteroids and subsequent orbital investigations
[NASA-CR-165004] N82-14039
SOCIETE NATIONALE D'ETUDES ET DE CONSTRUCTION DE MOTEURS D'AVIATION, MOISSY-CRAMAYEL (FRANCE).
A device for simulating at a compressor bench an air inlet with large incidence N82-13081
SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, TOULOUSE (FRANCE).
A numerical method for studying nacelle-jet-airfoil interaction in inviscid three-dimensional flow N82-13094
SOLAREX CORP., ROCKVILLE, MD.
A Module Experimental Process System Development Unit (MEPSDU)
[NASA-CR-165014] N82-13496
Design, fabrication, test, qualification, and price analysis of third generation design solar cell modules
[NASA-CR-165007] N82-13502
Silicon solar cell optimization
[AD-A106005] N82-13514
SOUTH CAROLINA ENERGY RESEARCH INST., COLUMBIA.
Residual-energy-applications program environmental analysis report
[DE81-027538] N82-13525
Residual-energy-application program: EAST facility requirements document, volume 1
[DE81-027536] N82-13526
SOUTH CAROLINA UNIV., COLUMBIA.
Study of corrugated plates N82-13426
A depositional model for major coal seams in the Rock Springs Formation, Upper Cretaceous, southwest Wyoming N82-13580
Structural and stratigraphic analysis of the paleozoic Murzuk and Ghadames basins, western Libya N82-13614
Quantum frames of reference N82-13822
SOUTHERN CALIFORNIA RESEARCH INST., LOS ANGELES.
Manual control analysis of drug effects on driving performance N82-13709
SPECTROLAB, INC., SYLMAR, CALIF.
High resolution, low cost solar cell contact development
[NASA-CR-165032] N82-13501
SPIRE CORP., BEDFORD, MASS.
HgCdTe fabrication using directed energy techniques
[AD-A105626] N82-13947
SPRINGBORN LABS., INC., ENFIELD, CONN.
Investigation of test methods, material properties, and processes for solar cell encapsulants
[NASA-CR-165031] N82-13503
SRI INTERNATIONAL CORP., MENLO PARK, CALIF.
Energy levels in and on an oxide film as measured by electrochemical methods
[AD-A103704] N82-13187
The chemical vapor deposition of iridium
[AD-A104582] N82-13360
Large amplitude compression and shear wave propagation in impact-loaded PMMA
[AD-A105953] N82-13450
STAATLICHES FORSCHUNGSINSTITUT FUER GEOCHEMIE, BAMBERG (WEST GERMANY).
Investigations towards the understanding of surface treatment of propellant grains by means of trace elements
[BMVG-FBWT-79-14] N82-13253
Examination of early wear detection in diesel engines by energy dispersive radioisotope X ray fluorescence analysis
[BMVG-FBWT-79-19] N82-13432
STANFORD LINEAR ACCELERATOR CENTER, CALIF.
Two-photon physics as a probe of hadron dynamics
[DE81-028757] N82-13858
STANFORD UNIV., CALIF.
Some observations of surface pressures and the near wake of a blunt trailing edge airfoil N82-13100
An experimental investigation of the flow past a finite circular cylinder at a low subcritical Reynolds number N82-13105
Aerodynamics of an airfoil with a jet issuing from its surface N82-13121
Unsteady aeroelastic modeling and trailing-edge flap control of an experimental wing in a two dimensional wind tunnel N82-13122
Design for active and passive flutter suppression and gust alleviation
[NASA-CR-3482] N82-13147
Technical basis for efficient management of geostationary satellite orbit/spectrum N82-13159
On the modeling and control of flexible space structures N82-13168
A miniature, thin-film thermal conductivity detector for an integrated gas chromatograph N82-13200
Two studies of fluidized beds: Heat transfer and grid jets N82-13203
Acoustic nondestructive evaluation of microstructure N82-13211
Strengthening phases and deformation mechanisms in dispersion strengthened solid solutions and pure metals N82-13229
A study of the surface reactivity of silver: An acid base characterization of oxidation reactions N82-13233
Micromechanics of expansive mechanisms in expansive cement concretes N82-13258
Energy spectral analysis in projection radiography N82-13293
Spectral efficiency of amplitude companded sideband systems N82-13345
Topics in digital signal processing N82-13346
Charge-based modeling of capacitance in MOS transistors N82-13350
Linear acousto-optic filtering with heterodyne and frequency-plane control N82-13352
A relativistic magnetron with a thermionic cathode N82-13353
Frequency sampling filters, design and applications N82-13354
A simplified two-dimensional numerical analysis of MOS devices including transient penomena N82-13372
Impacts of vertical scale distortion on turbulent mixing in hydraulic models N82-13382
Mixing of a passive scalar in isotropic and sheared homogeneous turbulence N82-13405
Atomic pair processes and laser applications N82-13417
Laser induced charge transfer collisions N82-13418
Inverse cerenkov interaction between relativistic electrons and laser light N82-13425
A continuum model for friction with applications in metal forming plasticity N82-13445
The occurrence and control of land subsidence due to ground water withdrawal with special reference to the San Joaquin and Santa Clara Valleys, California N82-13466
Electrical effects of slag in a diffuse mode magnetohydrodynamic generator N82-13550
The crustal structure of Kilauea and Mauna Loa volcanoes, Hawaii, from seismic refraction and gravity data N82-13583
Surface waves in strong ground motion with application to offshore environments N82-13584
Theory and application of experimental model analysis in earthquake engineering N82-13588
Studies of natural fractures, fault zone permeability, and a pore space-permeability model N82-13616
Two detailed seismic studies in Central California. Part 1: Earthquake clustering and crustal structure studies of the San Andreas fault near San Juan Bautista. Part 2: Seismic velocity structure along the Sierra foothills near Oroville, California N82-13617
Superconducting magnetometry for cardiovascular studies and an application of adaptive filtering N82-13648
A systems analysis of the maturation of sleep using a semi-Markov model N82-13658
Algorithms for imaging myocardial blood flow using X-ray computed tomography N82-13661
Information storage in a decentralized computer system N82-13732
Capacity and coding for computer memory with defects N82-13750
Concurrent testing and checking in computer systems N82-13751
Automated partitioning of hierarchically specified digital systems N82-13752
Symbolic reasoning among 3-D models and 2-D images N82-13761
Query optimization by semantic reasoning N82-13762
Trellis data compression N82-13784
Sequential stochastic construction of random polygons N82-13812
Acoustical speckle interferometry and applications in experimental mechanics N82-13826
Transmission of sound across a vortex layer enclosing a cylindrical column of jet N82-13838
Fiber optic time domain reflectometers: Approaches to performance improvement N82-13893
A vacuum ultraviolet radiation source using Cerenkov radiation N82-13894
Pulse propagation in dispersive media with applications to plasmas N82-13897
The reverse-field rigid rotor model, calculation and simulation N82-13898
Current transient spectroscopy of deep levels in silicon N82-13929
Superconductivity of the A15 compound niobium aluminum N82-13932
Long-range interactions in lattice field theory N82-13941
Upper critical fields and span states in A-15 superconductors, part 1. Vortices in two-dimensional superconductors, part 2 N82-13942
CW laser annealing and CW laser assisted diffusion in gallium arsenide N82-13943
Electron beam evaporation of superconducting, A15 niobium-silicon N82-13944
The physical and electrical properties of polycrystalline-silicon N82-13964
Experimental and theorectical studies of excited state transport N82-13967
X-ray and ultraviolet observations of stellar atmospheres N82-14029
STATE UNIV. OF NEW YORK, ALBANY.
Construction and maintenance of SUNY facilities at the National Synchrotron Light Source
[DE81-027855] N82-13152
STATE UNIV. OF NEW YORK, STONY BROOK.
Ultraviolet structure of supersymmetric non-linear sigma-models N82-13843
STATE UNIV. OF NEW YORK AT ALBANY.
Relativistic many-body perturbation theory of parity-violation in atoms N82-13845

STATE UNIV. OF NEW YORK AT BINGHAMTON.
The missing boundary problem for smooth manifolds of dimension greater than or equal to six N82-13806
STICHTING MATHEMATISCH CENTRUM, AMSTERDAM (NETHERLANDS).
Proving total correctness of nondeterministic programs in infinitary logic [MC-IW-150/80] N82-13799
STOCKHOLM UNIV. (SWEDEN).
On the inadequacy of one dimensional ocean models for the global carbon cycle [CM-51] N82-13643
SWEDISH INST. FOR MATERIALS TESTING, BORAS.
Aging and corrosion problems with flat solar energy absorbers. Study based upon literature and experiment exchanges [SP-RAPP-1979/4] N82-13548
SYRACUSE UNIV., N. Y.
Deposition of aerosol particles in the human respiratory tract N82-13659
Direct execution string processor N82-13753
Methods of verification of digital logic N82-13783
Zeros of successive derivatives of some entire functions of infinite order N82-13788
SYSTEMS APPLICATIONS, INC., SAN RAFAEL, CALIF.
Development of an infrared radiative heating model [NASA-CR-166272] N82-13622
SYSTEMS CONTROL, INC., PALO ALTO, CALIF.
Sensor failure detection system [NASA-CR-165515] N82-13145
Research on knowledge based programming and algorithm design [AD-A105661] N82-13770
SYSTEMS TECHNOLOGY, INC., HAWTHORNE, CALIF.
Using rewards and penalties to obtain desired subject performance N82-13684
A theory of human error N82-13716
Stability analysis of automobile driver steering control N82-13717
Detecting human operator impairment with a psychomotor task N82-13718
SYSTEMS TECHNOLOGY, INC., MOUNTAIN VIEW, CALIF.
A comparison of landing maneuver piloting technique based on measurements made in an airline training simulator and in actual flight N82-13685
Identification of multiloop pilot describing functions obtained from simulated approaches to an aircraft carrier N82-13686

T

TECHNICAL RESEARCH CENTRE OF FINLAND, ESPOO.
Thin-walled structures. Trapezoidal sheet bending and under shear stresses [VTT-11] N82-13456
TECHNION - ISRAEL INST. OF TECH., HAIFA.
Predictor symbology in computer-generated perspective displays N82-13674
TECHNISCHE UNIVERSITAET, MUNICH (WEST GERMANY).
Influence of wall roughness, adverse pressure gradient and heat transfer on wall shear stress measurements with Preston tubes [ILR-50] N82-13396
TEKTRONIX, INC., BEAVERTON, OREG.
Computer programs for line shape analysis of X-ray diffraction peaks [PB81-227787] N82-13958
TEMPLE UNIV., PHILADELPHIA, PA.
Fluorescent guest-host effect in scattering liquid crystals and new physical phenomena in thin liquid crystal films N82-13940
TENNESSEE UNIV., KNOXVILLE.
The chemistry of saline water chlorination N82-13178
Electrochemical and spectroscopic studies of some less stable oxidation states of selected lanthanide and actinide elements N82-13182
Spectroelectrochemical investigations in molten salt and aqueous media N82-13183
Effects of restrained thermal movement in a continuous, prestressed concrete bridge without interior expansion joints N82-13461
Prediction of aerodynamic loads on aircrafts with external stores at transonic speeds N82-13813
Hot-electron ring stability at the University of Tennessee N82-13914
TENNESSEE UNIV. SPACE INST., TULLAHOMA.
Two-dimensional effects in power take-off region [DE82-000091] N82-13367
TEXAS A&M UNIV., COLLEGE STATION.
A data collection scheme for identification of parameters in a driver model N82-13696
New optimization research [AD-A104864] N82-13793
Study of the neutron-proton interaction in the 300-700 MeV energy region [DE81-026733] N82-13859
TEXAS UNIV., AUSTIN.
Eigenmode stability analysis for a bumpy torus N82-13915
Numerical solutions of the EBT Radial eigenmode problem N82-13916
TEXAS UNIV. AT ARLINGTON.
The transonic flow field for a fluidic-generator fuze assembly [AD-A099616] N82-13388
Acoustical properties of sediments [AD-A103726] N82-13638
Theoretical analysis of the effects of turbulence on a mobile parametric receiver [AD-A101418] N82-13833
TEXAS UNIV. AT AUSTIN.
Observations of faint comets at McDonald Observatory: 1978-1980 N82-14010
TEXTRON BELL HELICOPTER, FORT WORTH, TEX.
How the helicopter cockpit designer uses digital avionics N82-13049
THOMSON-CSF, PARIS (FRANCE).
Head up displays N82-13052
TOLEDO UNIV., OHIO.
Observing chemical abundances in comets N82-13990
The spectroscopy of comets: Introductory remarks N82-14004
TORONTO UNIV., DOWNSVIEW (ONTARIO).
On a dusty-gas shock tube [UTIAS-250] N82-13151
Gas target neutron generator studies [UTIAS-251] N82-13850
TRANSPORTATION SYSTEMS CENTER, CAMBRIDGE, MASS.
Evaluation of techniques for reducing in-use automotive fuel consumption [PB81-233298] N82-13985
Highway fuel economy study [PB81-233850] N82-13986
Weight reduction potential of automobiles and light trucks: 1980 summary source document [PB81-235756] N82-13987
TRI-STATE REGIONAL PLANNING COMMISSION, NEW YORK.
Measures of effectiveness of transportation systems management [PB81-233884] N82-13984
TUFTS UNIV., MEDFORD, MASS.
Interruption as a test of the user-computer interface N82-13721

U

ULTRASYSTEMS, INC., IRVINE, CALIF.
Feasibility study report for the Imperial Valley Ethanol Refinery: A 14.9-million-gallon-per-year ethanol synfuel refinery utilizing geothermal energy [DE82-000288] N82-13252
UNIDYNAMICS/PHOENIX, ARIZ.
Review of low-voltage CP detonators [DE81-025837] N82-13250
Performance of chemical analogs of the explosive CP [DE81-025836] N82-13251
UNION CARBIDE CORP., OAK RIDGE, TENN.
Flat-plate solar array project: Experimental process system development unit for producing semiconductor-grade silicon using the silane-to-silicon process [NASA-CR-165022] N82-13498
UNITED AIR LINES, INC., SAN FRANCISCO, CALIF.
An automated system for global atmospheric sampling using B-747 airliners [NASA-CR-165264] N82-13554
UNITED TECHNOLOGIES RESEARCH CENTER, EAST HARTFORD, CONN.
Flow distribution control characteristics in marine gas turbine waste-heat recovery systems. Phase 1: Flow distribution characteristics and control in diffusers [AD-A104560] N82-13390
US ALCOHOL FUELS, EAST MESA, CALIF.
Feasibility study report for the Imperial Valley Ethanol Refinery: A 14.9-million-gallon-per-year ethanol synfuel refinery utilizing geothermal energy [DE82-000288] N82-13252
UTAH STATE UNIV., LOGAN.
Detection of trace gases using high resolution spectroscopy [AD-A104841] N82-13883

V

VALEO/SOCIETE ANONYME FRANCAISE DU FERODO (FRANCE).
The influence of high temperature on braking N82-13433
VARIAN ASSOCIATES, PALO ALTO, CALIF.
Three-5 heterostructure avalanche photodiode modules for fiber optic communication links in the 1.0 to 1.3 micrometer spectral range [AD-A099508] N82-13334
VEREINIGTE FLUGTECHNISCHE WERKE G.M.B.H., BREMEN (WEST GERMANY).
The role and implementation of different nacelle/engine simulation concepts for wind-tunnel testing in research and development work on transport aircraft N82-13086
Calculation of wing-body-nacelle interference in subsonic and transonic potential flow N82-13095
Maneuver load control for the reduction of design loads and improvement of the maneuverability of modern fighter aircraft [BMVG-FBWT-81-2] N82-13138
VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Regularized integration of gravity-perturbed trajectories: A numerical efficiency study N82-13155
Creep and creep rupture of laminated graphite/epoxy composites N82-13173
Bounding signal levels at terminations of multiconductor transmission line behind an aperture [AD-A102031] N82-13362
Computer programs for line shape analysis of X-ray diffraction peaks [PB81-227787] N82-13958
VIRGINIA UNIV., CHARLOTTESVILLE.
Trapped ion research [AD-A098648] N82-13188
VOLVO FLYGMOTOR A.B., TROLLHAETTAN (SWEDEN).
A synthesis method for estimating maximum instantaneous inlet distortion based on measured inlet steady state and RMS pressures N82-13083

W

WASHINGTON STATE UNIV., PULLMAN.
Determination of radionuclide species by on-line radiochromatography using high resolution gamma ray spectroscopy N82-13181
WASHINGTON UNIV., ST. LOUIS, MO.
Spectral imagery: Recent results with the SPIFI and their implications for cometary atmospheric studies N82-14011
Potassium-argon and iodine-xenon gas retention ages of enstatite chondrite meteorites N82-14036
WATER AND POWER RESOURCES SERVICE, DENVER, COLO.
Project Skywater: Fiscal year 1979 report. Atmospheric Resources Research Program [PB81-234494] N82-13629
The Sierra Cooperative Pilot Project: Precipitation management research in the Sierra Nevada [PB81-234452] N82-13630
WATERLOO UNIV. (ONTARIO).
Cyclic strain approach to fatigue in metals N82-13285

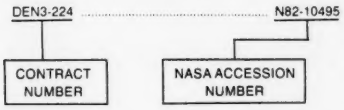
WEST VIRGINIA UNIV., MORGANTOWN.
Reduction of nitric oxide in a fluidized bed .
[DE81-030488] N82-13198
Pyrolytic characterization of the organic matter in selected coals and in the Devonian shales of southern West Virginia N82-13578
WESTINGHOUSE ELECTRIC CORP., LIMA, OHIO.
High voltage DC switchgear development for multi-kW space power system: Aerospace technology development of three types of solid state power controllers for 200-1100VDC with current ratings of 25, 50, and 80 amperes with one type utilizing an electromechanical device
[NASA-CR-165413] N82-13357
WESTINGHOUSE RESEARCH AND DEVELOPMENT CENTER, PITTSBURGH, PA.
A preliiminary analysis of the data from experiment 77-13 and final report on glass fining experiments in zero gravity
[NASA-CR-161884] N82-13154
Large area sheet task: Advanced dendritic web growth development
[NASA-CR-165013] N82-13497
Cell module and fuel conditioner development
[NASA-CR-165462] N82-13511
WIEN UNIV. (AUSTRIA).
Outburst and nuclear breakup of Comet Halley - 1910 N82-14018
WISCONSIN UNIV. - MADISON.
Quantitative investigations of mixed oxidation states of some first row transition metals in insulator matrices by photoelectron spectroscopy N82-13184
Structure-property relationships in segmented elastomers: Small angle X-ray scattering, thermal, and mechanical studies N82-13240
Electrostatic and hydrodynamic interactions of charged macromolecular systems N82-13242
AC harmonic filtering using controlled current injection N82-13348
Development, analysis and control of the inductor-converter bridge N82-13349
Direct digital simulation of power semiconductor-controlled electrical machines N82-13355
Analysis of multicylinder IC-Engine crankshafts with hydrodynamic bearings using a finite element-transfer matrix approach N82-13437
Regional hydrologic models for climatology: An application to three Wisconsin watersheds N82-13467
Algorithms for the geometry of semi-algebraic sets N82-13763
A control canonical form for a class of linear hyperbolic systems N82-13786
A nonlinear conservation law with memory
[AD-A103882] N82-13791
The relationship between the number of factors and size of an experiment
[AD-A103877] N82-13792
On the dependence of the growth of an entire function of the distribution of the zeros of its derivatives and a conjecture of G. Polya N82-13805
The hadronic decay rate of the Higgs boson: An application of the running mass N82-13842
Coexistence of non-registered monolayer and bilayer solid films N82-13931
Composition dependence of neodymium optical homogeneous linewidths in glasses N82-13945
WISCONSIN UNIV., MADISON.
Energy generation and the sulfur-carbon cycle
[DE81-030949] N82-13562
Driving force of the ballooning instability
[DE81-023099] N82-13923

Y

YALE UNIV., NEW HAVEN, CONN.
Intermediate band surface photometry of elliptical galaxies N82-14035
YOUNG (ARTHUR) AND CO., WASHINGTON, D. C.
Managing information technology change in the decade of the 80's
[AD-A099441] N82-13976

CONTRACT NUMBER INDEX

Typical Contract Number Index Listing



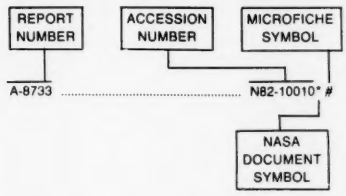
Listings in this index are arranged alphanumerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

AF PROJ. 2003 ..... N82-13135
AF PROJ. 2180 ..... N82-13359
AF PROJ. 2305 ..... N82-13336
N82-13364
AF PROJ. 2308 ..... N82-13879
AF PROJ. 2402 ..... N82-13448
AF PROJ. 3145 ..... N82-13514
AF PROJ. 4519 ..... N82-13339
AF PROJ. 4600 ..... N82-13167
AF PROJ. 6670 ..... N82-13335
N82-13624
AF PROJ. 7670 ..... N82-13883
AF PROJ. 8809 ..... N82-13391
AF-AFOSR-0138-80 ..... N82-13362
AF-AFOSR-3303-77 ..... N82-13151
AF-AFOSR-3654-78 ..... N82-13738
AF-AFOSR-3733-78 ..... N82-13740
ARPA ORDER 2180 ..... N82-13359
ARPA ORDER 3045 ..... N82-13337
ARPA ORDER 3397 ..... N82-13260
ARPA ORDER 3655 ..... N82-13878
DA PROJ. 1L1-61101-A-91-A N82-13513
DA PROJ. 1L1-61102-AH-43 ..... N82-13447
DA PROJ. 1L1-62105-AH-84 ..... N82-13446
DA PROJ. 1L1-62662-A-554 ..... N82-13882
DA PROJ. 1L1-62701-AH-92 ..... N82-13334
DA PROJ. 1L2-62209-AH-76 ..... N82-13107
DA PROJ. 4A1-61102-AT-24 ..... N82-13471
DAAB07-78-C-2402 ..... N82-13334
DAAG29-77-C-0028 ..... N82-13260
DAAG29-78-C-0025 ..... N82-13187
DAAG29-78-C-0030 ..... N82-13450
DAAG29-79-C-0155 ..... N82-13742
DAAG29-80-C-0041 ..... N82-13791
N82-13792
DAAG29-80-C-0074 ..... N82-13880
DAAK11-80-C-0050 ..... N82-13699
DAAK21-80-P-5171 ..... N82-13388
DAAK30-79-C-0136 ..... N82-13219
DAAK60-79-C-0097 ..... N82-13724
DAAK80-79-C-0270 ..... N82-13141
DAJA37-80-C-0193 ..... N82-13603
DARPA ORDER 3687 ..... N82-13770
DARPA ORDER 3800 ..... N82-13947
DARPA ORDER 3828 ..... N82-13770
DE-AC01-76ET-10204 ..... N82-13248
DE-AC01-76ET-10785 ..... N82-13926
DE-AC01-77ET-29069 ..... N82-13368
DE-AC01-79RA-20216 ..... N82-13247
DE-AC02-76CH-00016 ..... N82-13517
N82-13825
N82-13856
DE-AC02-76CH-03073 ..... N82-13924
DE-AC02-76ER-01198 ..... N82-13836
N82-13949
DE-AC02-76ER-01545 ..... N82-13872
DE-AC02-76ET-20279 ..... N82-13533
DE-AC02-77CH-00178 ..... N82-13197
N82-13264
N82-13265
N82-13528
N82-13531
N82-13539
N82-13540
N82-13541
N82-13542
DE-AC02-77ER-04169 ..... N82-13192
DE-AC02-78ET-29232 ..... N82-13544
DE-AC02-79ET-10815 ..... N82-13367
DE-AC02-80ER-10759 ..... N82-13152
DE-AC02-80ER-10766 ..... N82-13647
DE-AC02-80EV-10405 ..... N82-13557
DE-AC02-80EV-10414 ..... N82-13475
DE-AC03-76SF-00515 ..... N82-13858
DE-AC03-79CS-30203 ..... N82-13534
DE-AC03-79SF-10538 ..... N82-13983
DE-AC04-76DP-00487 ..... N82-13249
DE-AC04-76DP-00789 ..... N82-13190
N82-13250
N82-13251
N82-13365
N82-13366
N82-13452
N82-13453
N82-13520
N82-13529
N82-13530
N82-13532
N82-13775
N82-13885
N82-13888
N82-13956
DE-AC04-76DP-03533 ..... N82-13195
DE-AC05-76OR-00033 ..... N82-13538
N82-13558
DE-AC06-76RL-01830 ..... N82-13409
N82-13535
N82-13566
N82-13567
N82-13627
DE-AC07-76ID-01570 ..... N82-13971
DE-AC09-77ET-12866 ..... N82-13525
N82-13526
DE-AC14-76FF-02170 ..... N82-13951
DE-AC22-80PC-30264 ..... N82-13196
DE-AC22-80PC-30302 ..... N82-13246
DE-AI01-76ET-20320 ..... N82-13505
DE-AI01-76ET-20356 ..... N82-13492
N82-13494
DE-AI01-77CS-51040 ..... N82-13114
N82-13507
N82-13510
DE-AI01-77CS-51044 ..... N82-13506
DE-AI01-77ET-10350 ..... N82-13504
N82-13509
DE-AI01-77ET-10769 ..... N82-13908
DE-AI01-79ET-29372 ..... N82-13493
DE-AI01-80CS-50194 ..... N82-13961
DE-AI01-80ER-10160 ..... N82-13157
DE-AI01-80ET-17088 ..... N82-13511
DE-AI01-81CS-50006 ..... N82-13243
DE-AI01-81ET-20307 ..... N82-13495
DE-AI06-79RL-10077 ..... N82-13157
DE-AI08-79DP-40092 ..... N82-13852
DE-AS02-76ET-53051 ..... N82-13923
DE-AS02-76EV-02161 ..... N82-13562
DE-AS05-76ER-04449 ..... N82-13859
DE-AT03-76ET-51011 ..... N82-13921
N82-13978
DE-AT03-76SF-74016 ..... N82-13451
DE-AT06-76EV-0001 ..... N82-13474
DE-AT21-79MC-11284 ..... N82-13198
DE-FG07-80RA-50308 ..... N82-13252
DEN3-83 ..... N82-13510
DEN3-125 ..... N82-13506
DEN3-161 ..... N82-13511
DEN3-203 ..... N82-13505
DEN3-241 ..... N82-13490
DI-14-34-0001-0131 ..... N82-13480
DNA001-79-C-0158 ..... N82-13220
DOT-HS-8-02052 ..... N82-13718
E(40-1)-4449 ..... N82-13859
EG-77-C-01-1012 ..... N82-13531
EG-77-C-01-4042 ..... N82-13264
N82-13265
N82-13528
N82-13539
N82-13541
N82-13542
EPA-IAG-D5-E693 ..... N82-13572
N82-13573
EPA-IAG-D7-01027 ..... N82-13556
EPA-R-803612 ..... N82-13574
EPA-68-02-1885 ..... N82-13270
EPA-68-02-2616 ..... N82-13256
EPA-68-02-3170 ..... N82-13576
EPA-68-03-2550 ..... N82-13575
EPRI PROJ. RP-862 ..... N82-13569
EPRI PROJ. S103-2 ..... N82-13884
EPRI PROJ. TPS-76-661 ..... N82-13559
EPRI PROJ. 862 ..... N82-13563
N82-13564
N82-13568
N82-13570
EPRI PROJ. 1081-3 ..... N82-13544
EPRI PROJ. 1201-13 ..... N82-13537
EPRI PROJ. 1266-7-1 ..... N82-13431
EPRI PROJ. 1648-2 ..... N82-13430
ESTEC-3652/78/NL-AK(SC) N82-13370
ESTEC-4182/79/NL-PP(SC) N82-13780
ET-78-C-01-2159 ..... N82-13544
EX-76-A-29-1012 ..... N82-13494
EY-76-C-02-1545 ..... N82-13872
F04701-77-C-0078 ..... N82-13985
F04701-80-C-0081 ..... N82-13600
N82-13601
N82-13946
F19628-77-C-0203 ..... N82-13883
F19628-77-C-0245 ..... N82-13167
F19628-77-C-0260 ..... N82-13364
F19628-78-C-0198 ..... N82-13340
F19628-78-C-0224 ..... N82-13336
F19628-78-C-0225 ..... N82-13359
F29601-78-C-0006 ..... N82-13391
F30602-78-C-0120 ..... N82-13739
F30602-79-C-0018 ..... N82-13878
F30602-79-C-0055 ..... N82-13339
F33615-78-C-2039 ..... N82-13514
F33615-79-C-1878 ..... N82-13135
F33615-79-C-3018 ..... N82-13079
F33615-80-C-0528 ..... N82-13695
F33615-80-C-3403 ..... N82-13448
F44620-76-C-0105 ..... N82-13879
F47620-79-C-0147 ..... N82-13733
F49620-8-C-0073 ..... N82-13694
F49620-77-C-0023 ..... N82-13979
F49620-79-C-0012 ..... N82-13598
F49620-79-C-0233 ..... N82-13667
HPR PROJ. 646 ..... N82-13267
JPL PROJ. 5101-176 ..... N82-13494
JPL PROJ. 5105-76 ..... N82-13495
JPL PROJ. 5240-11 ..... N82-13492
JPL-699911 ..... N82-14010
JPL-708823 ..... N82-14010
JPL-954334 ..... N82-13498
JPL-954527 ..... N82-13503
JPL-954888 ..... N82-13500
JPL-955404 ..... N82-13502
JPL-955531 ..... N82-13171

JPL-955725 ..... N82-13501
JPL-955843 ..... N82-13497
JPL-955902 ..... N82-13496
JPL-955986 ..... N82-13499
MDA903-79-C-0320 ..... N82-13136
MDA903-79-C-0434 ..... N82-13947
MDA903-79-C-0690 ..... N82-13976
MIPR-Z-70099 ..... N82-13512
NAG1-142 ..... N82-13828
NAG1-157 ..... N82-13150
NAG1-217 ..... N82-13669
NAG2-59 ..... N82-14043
NAG2-75 ..... N82-13662
N82-13663
NAG3-44 ..... N82-13217
NAG4-1 ..... N82-13693
NASA ORDER C-57307-D N82-13243
NASA-CR-165023 ..... N82-14043
NASW-3302 ..... N82-13674
NAS1-14623 ..... N82-13098
NAS1-16135 ..... N82-13690
NAS1-16383 ..... N82-13356
NAS2-9741 ..... N82-13664
NAS2-10019 ..... N82-13622
NAS2-10047 ..... N82-13662
N82-13663
NAS2-10081 ..... N82-13046
NAS2-10100 ..... N82-13096
NAS2-10139 ..... N82-13108
NAS2-10400 ..... N82-13716
NAS3-17867 ..... N82-13554
NAS3-21287 ..... N82-13508
NAS3-21755 ..... N82-13357
NAS3-21960 ..... N82-13427
NAS3-22481 ..... N82-13145
NAS3-22496 ..... N82-13302
NAS5-26361 ..... N82-13470
NAS7-100 ..... N82-13166
N82-13300
N82-13301
N82-13386
N82-13491
N82-13492
N82-13493
N82-13494
N82-13495
N82-13665
N82-13707
N82-13719
N82-13766
N82-13767
N82-13768
N82-13876
N82-13877
N82-13981
N82-13989
N82-13995
N82-14026
N82-14037
NAS8-33017 ..... N82-13154
NAS8-33191 ..... N82-13764
NAS8-33458 ..... N82-13621
NAS8-33576 ..... N82-13428
NAS8-33806 ..... N82-13765
NAS9-15800 ..... N82-13723
NCC2-86 ..... N82-13711
N82-13712
NGL-03-002-002 ..... N82-14005
NGL-05-020-243 ..... N82-13147
NGR-03-003-001 ..... N82-13997
NGR-09-015-212 ..... N82-14039
NGR-21-001-001 ..... N82-14009
NGR-44-012-052 ..... N82-14010
NIDA-271-76-3316 ..... N82-13709
NIH-NS-00196 ..... N82-13708
NIH-NS-12877 ..... N82-13708
NR PROJ. 083-603 ..... N82-13599
NR PROJ. 097-411 ..... N82-13390
NR PROJ. 150-453 ..... N82-13816
NR PROJ. 347-059 ..... N82-13796
NRC-03-78-148 ..... N82-13449
NS-12877 ..... N82-13698
NSF AST-79-07830 ..... N82-14002
NSF AST-79-14789 ..... N82-13990
NSF DMR-75-17201 ..... N82-13958
NSF EAR-77-28552 ..... N82-13599
NSF ENG-76-08754 ..... N82-13698
N82-13708
NSF ENG-78-03400 ..... N82-13914
NSF MCS-77-15628 ..... N82-13742
NSF MCS-79-24370 ..... N82-13742
NSF MCS-80-005856 ..... N82-13734
NSF PFR-78-05694 ..... N82-13271
NSF PHY-80-09788 ..... N82-13825
NSF SES-79-06386 ..... N82-13815
NSG-C-5071 ..... N82-14023
NSG-2165 ..... N82-13186
NSG-3230 ..... N82-13507
NSG-5270 ..... N82-13596
NSG-5393 ..... N82-14009
NSG-7082 ..... N82-14015
NSG-7301 ..... N82-13990
NSG-7322 ..... N82-13997
NSG-7334 ..... N82-14011
N00014-73-C-0438 ..... N82-13817
N00014-75-C-0209 ..... N82-13599
N00014-75-C-0661 ..... N82-13797
N00014-75-C-1183 ..... N82-13337
N00014-76-C-0117 ..... N82-13638
N00014-76-C-0616 ..... N82-13666
N00014-76-C-1092 ..... N82-13736
N00014-78-C-0198 ..... N82-13189
N00014-78-C-0426 ..... N82-13793
N00014-78-C-0772 ..... N82-13188
N00014-79-C-0034 ..... N82-13221
N00014-79-C-0127 ..... N82-13770
N00014-79-C-0801 ..... N82-13794
N82-13795
N00014-79-C-0873 ..... N82-13742
N00014-79-C-0880 ..... N82-13360
N00014-80-C-0045 ..... N82-13770
N00014-80-C-0150 ..... N82-13817
N00014-80-C-0169 ..... N82-13796
N00014-80-C-0221 ..... N82-13742
N00014-80-C-0273 ..... N82-13642
N00014-80-C-0305 ..... N82-14023
N00014-80-C-0402 ..... N82-13816
N00014-80-C-0476 ..... N82-13390
N00014-80-C-0636 ..... N82-13821
N00014-80-C-0637 ..... N82-13815
N00014-80-C-0650 ..... N82-13734
N82-13820
N00014-80-K-0816 ..... N82-13735
N00014-81-K-0360 ..... N82-13735
N00019-79-C-0225 ..... N82-13835
N00024-77-C-6200 ..... N82-13833
N00024-78-C-5384 ..... N82-13512
N62269-79-C-0496 ..... N82-13683
N68463-80-C-0035 ..... N82-13834
OWRT PROJ. A-089-GA(1) N82-13476
PHS-1-P11-LM-03374-02 ..... N82-13797
PROJ. 1013 ..... N82-13252
RF PROJ. 761415/711621 ..... N82-13662
N82-13663
RF PROJ. 762501/713447 ..... N82-13662
N82-13663
RR0221141 ..... N82-13261
SRI PROJ. 1013 ..... N82-13360
SRI PROJ. 7592 ..... N82-13187
SR0140301 ..... N82-13741
W-7405-ENG-26 ..... N82-13194
N82-13222
N82-13245
N82-13392
N82-13516
N82-13523
N82-13536
N82-13556
N82-13560
N82-13652
N82-13678
N82-13679
N82-13771
N82-13855
N82-13860
N82-13863
N82-13871
N82-13873
N82-13909
N82-13911
N82-13952
N82-13953
N82-13977
W-7405-ENG-36 ..... N82-13223
N82-13224
N82-13263
N82-13393
N82-13394
N82-13422
N82-13423
N82-13424
N82-13454
N82-13473
N82-13521
N82-13565
N82-13743
N82-13774
N82-13853
N82-13861
N82-13866
N82-13890
N82-13925
N82-13950
N82-13954
N82-14032
W-7405-ENG-48 ..... N82-13225
N82-13244
N82-13395
N82-13407
N82-13408
N82-13429
N82-13524
N82-13527
N82-13543
N82-13561
N82-13772
N82-13773
N82-13818
N82-13854
N82-13857
N82-13862
N82-13887
N82-13889
N82-13920
N82-13948
N82-13955
N82-13972
N82-14048
W-7504-ENG-82 ..... N82-13191
Z51100-00003 ..... N82-13597
146-10-06-02 ..... N82-13620
505-04-13-01 ..... N82-13045
505-11-23-03 ..... N82-13110
505-31-31 ..... N82-13108
505-32-12 ..... N82-13146
505-32-32 ..... N82-13143
505-32-93-01 ..... N82-13142
505-35-21-01-00 ..... N82-13123
505-41-13-01 ..... N82-13047
505-42-13-04 ..... N82-13107
505-43-13-01 ..... N82-13148
505-43-14 ..... N82-13149
506-51-13-02 ..... N82-13106
506-52-12 ..... N82-13427
506-53-63-05 ..... N82-13383
506-55-52 ..... N82-13508
506-55-72 ..... N82-13357
665-10-40-04 ..... N82-13592
691-09-02-01 ..... N82-13468
778-11-05 ..... N82-13908
778-11-06 ..... N82-13509
778-34-05 ..... N82-13981
778-36-06 ..... N82-13506
778-37-12 ..... N82-13243

REPORT / ACCESSION NUMBER INDEX

Typical Report / Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-8563 ..... N82-13108* #
A-8745 ..... N82-13637* #

ACS-12388 ..... N82-13141 #

AD-A098648 ..... N82-13188 #
AD-A098962 ..... N82-13139
AD-A098979 ..... N82-13881 #
AD-A099305 ..... N82-13625 #
AD-A099439 ..... N82-13946 #
AD-A099441 ..... N82-13976 #
AD-A099442 ..... N82-13156 #
AD-A099453 ..... N82-13600 #
AD-A099454 ..... N82-13448 #
AD-A099459 ..... N82-13599 #
AD-A099471 ..... N82-13512 #
AD-A099476 ..... N82-13361 #
AD-A099494 ..... N82-13882 #
AD-A099506 ..... N82-13334 #
AD-A099616 ..... N82-13388 #
AD-A099741 ..... N82-13982 #
AD-A099776 ..... N82-13735 #
AD-A099778 ..... N82-13626 #
AD-A100189 ..... N82-13738 #
AD-A100208 ..... N82-13335 #
AD-A100212 ..... N82-13336 #
AD-A100282 ..... N82-13624 #
AD-A100349 ..... N82-13650 #
AD-A100669 ..... N82-13358 #
AD-A100675 ..... N82-13189 #
AD-A101123 ..... N82-13598 #
AD-A101333 ..... N82-13447 #
AD-A101380 ..... N82-13642 #
AD-A101418 ..... N82-13833 #
AD-A101426 ..... N82-13852 #
AD-A101457 ..... N82-13135 #
AD-A101722 ..... N82-13446 #
AD-A101852 ..... N82-13797 #
AD-A101986 ..... N82-13817 #
AD-A102031 ..... N82-13362 #
AD-A102045 ..... N82-13725 #
AD-A102046 ..... N82-13449 #
AD-A102047 ..... N82-13555 #
AD-A102049 ..... N82-13741 #
AD-A102055 ..... N82-13740 #
AD-A102104 ..... N82-13724 #
AD-A102199 ..... N82-13340 #
AD-A102280 ..... N82-13742 #
AD-A102303 ..... N82-13339 #
AD-A102348 ..... N82-13363 #
AD-A102460 ..... N82-13438 #
AD-A102516 ..... N82-13220 #
AD-A102566 ..... N82-13165 #
AD-A102583 ..... N82-13796 #
AD-A102761 ..... N82-13219 #

AD-A103013 ..... N82-13816 #
AD-A103024 ..... N82-13513 #
AD-A103042 ..... N82-13603 #
AD-A103159 ..... N82-13737 #
AD-A103173 ..... N82-13641 #
AD-A103175 ..... N82-13727 #
AD-A103277 ..... N82-13639 #
AD-A103279 ..... N82-13640 #
AD-A103342 ..... N82-13337 #
AD-A103567 ..... N82-13260 #
AD-A103704 ..... N82-13187 #
AD-A103705 ..... N82-13880 #
AD-A103726 ..... N82-13638 #
AD-A103731 ..... N82-13471 #
AD-A103733 ..... N82-13472 #
AD-A103738 ..... N82-13597 #
AD-A103744 ..... N82-13649 #
AD-A103795 ..... N82-13734 #
AD-A103796 ..... N82-13820 #
AD-A103838 ..... N82-13736 #
AD-A103877 ..... N82-13792 #
AD-A103882 ..... N82-13791 #
AD-A104072 ..... N82-13387 #
AD-A104112 ..... N82-13975 #
AD-A104124 ..... N82-13974 #
AD-A104174 ..... N82-13815 #
AD-A104182 ..... N82-13821 #
AD-A104253 ..... N82-13262 #
AD-A104379 ..... N82-13739 #
AD-A104434 ..... N82-13979 #
AD-A104477 ..... N82-13795 #
AD-A104479 ..... N82-13794 #
AD-A104560 ..... N82-13390 #
AD-A104573 ..... N82-13338 #
AD-A104582 ..... N82-13360 #
AD-A104585 ..... N82-13333 #
AD-A104594 ..... N82-13832 #
AD-A104596 ..... N82-13831 #
AD-A104736 ..... N82-13601 #
AD-A104740 ..... N82-13303 #
AD-A104796 ..... N82-13167 #
AD-A104802 ..... N82-13602 #
AD-A104841 ..... N82-13883 #
AD-A104864 ..... N82-13793 #
AD-A105030 ..... N82-13359 #
AD-A105031 ..... N82-13814 #
AD-A105053 ..... N82-13261 #
AD-A105059 ..... N82-13879 #
AD-A105079 ..... N82-13733 #
AD-A105125 ..... N82-13878 #
AD-A105229 ..... N82-13769 #
AD-A105261 ..... N82-13420 #
AD-A105317 ..... N82-13141 #
AD-A105379 ..... N82-13389 #
AD-A105454 ..... N82-13421 #
AD-A105530 ..... N82-13221 #
AD-A105557 ..... N82-13364 #
AD-A105564 ..... N82-13391 #
AD-A105626 ..... N82-13947 #
AD-A105661 ..... N82-13770 #
AD-A105669 ..... N82-13834 #
AD-A105775 ..... N82-13136 #
AD-A105953 ..... N82-13450 #
AD-A106005 ..... N82-13514 #
AD-A106083 ..... N82-13835 #
AD-A106474 ..... N82-13311 #
AD-A106476 ..... N82-13294 #
AD-A106499 ..... N82-13323 #
AD-A106500 ..... N82-13327 #
AD-A106522 ..... N82-13297 #
AD-A106523 ..... N82-13304 #

AD-B060573 ..... N82-13318 #
AD-B060598 ..... N82-13307 #

AD-E410396 ..... N82-13882 #
AD-E500409 ..... N82-13136 #

AD-E850057 ..... N82-13626 #
AD-E950151 ..... N82-13363 #

AEROCHEM-TN-219 ..... N82-13192 #

AERONOMICA-ACTA-A-221-1980 ..... N82-13589

AFGL-AFSG-432 ..... N82-13625 #

AFGL-ERP-720 ..... N82-13335 #

AFGL-TR-80-0313 ..... N82-13625 #
AFGL-TR-80-0357 ..... N82-13335 #
AFGL-TR-81-0007 ..... N82-13624 #
AFGL-TR-81-0273 ..... N82-13883 #

AFHRL-TR-81-19 ..... N82-13725 #

AFOSR-81-0491TR ..... N82-13738 #
AFOSR-81-0586TR ..... N82-13740 #
AFOSR-81-0587TR ..... N82-13362 #
AFOSR-81-0615TR ..... N82-13879 #
AFOSR-81-0681TR ..... N82-13733 #

AFRRI-SR81-19 ..... N82-13649 #

AFSG-435 ..... N82-13624 #

AFWAL-TR-80-1223 ..... N82-13135 #
AFWAL-TR-80-3152 ..... N82-13448 #
AFWAL-TR-81-2052 ..... N82-13514 #
AFWAL-TR-81-4041 ..... N82-13982 #

AGARD-AG-160-VOL-13 ..... N82-13140* #

AGARD-AR-171 ..... N82-13384 #

AGARD-CP-301 ..... N82-13065 #
AGARD-CP-312 ..... N82-13048 #

AGARD-LS-118 ..... N82-13274 #

AIAA-81-2663 ..... N82-13144* #

AMSAA-TR-343 ..... N82-13814 #

ARBRL-TR-02324 ..... N82-13447 #

ARCSL-TR-81031 ..... N82-13882 #

ARL-TR-81-19 ..... N82-13833 #
ARL-TR-81-20 ..... N82-13638 #
ARL-TR-021 ..... N82-13651 #

ARLCB-TR-81025 ..... N82-13446 #

ARO-81-3 ..... N82-13727 #
ARO-15513.2-E ..... N82-13450 #
ARO-16451.6-EL ..... N82-13742 #
ARO-17243.1-P ..... N82-13880 #

AVRADCOM-TR-79-0270-5 ..... N82-13141 #
AVRADCOM-TR-81-B-5 ..... N82-13107* #

BETC/OP-79/2 ..... N82-13435 #

BM-IC-8847 ..... N82-13487 #

BM-RI-8531 ..... N82-13227 #
BM-RI-8532 ..... N82-13485 #
BM-RI-8536 ..... N82-13483 #
BM-RI-8537 ..... N82-13199 #
BM-RI-8538 ..... N82-13489 #
BM-RI-8542 ..... N82-13412 #
BM-RI-8548 ..... N82-13413 #

BM-SP-5-81 ..... N82-13488 #

BMFT-FB-T-80-179 ..... N82-13369 #
BMFT-FB-T-80-181 ..... N82-13957 #
BMFT-FB-T-80-182 ..... N82-13547 #
BMFT-FB-T-80-183 ..... N82-13411 #

BMFT-FB-W-80-011 ..... N82-13654 #
BMFT-FB-W-80-015 ..... N82-13605 #
BMFT-FB-W-80-024 ..... N82-13342 #
BMFT-FB-W-80-027 ..... N82-13164 #
BMFT-FB-W-80-034 ..... N82-13169 #
BMFT-FB-W-81-005 ..... N82-13777 #

BMVG-FBWT-79-14 ..... N82-13253 #
BMVG-FBWT-79-15 ..... N82-13115 #
BMVG-FBWT-79-17 ..... N82-13653 #
BMVG-FBWT-79-19 ..... N82-13432 #
BMVG-FBWT-79-20 ..... N82-13116 #
BMVG-FBWT-79-21 ..... N82-13341 #
BMVG-FBWT-80-1 ..... N82-13163 #
BMVG-FBWT-80-6 ..... N82-13546 #
BMVG-FBWT-80-11 ..... N82-13117 #
BMVG-FBWT-80-12 ..... N82-13137 #
BMVG-FBWT-80-18 ..... N82-13455 #
BMVG-FBWT-81-1 ..... N82-13457 #
BMVG-FBWT-81-2 ..... N82-13138 #

BNL-29769 ..... N82-13825 #
BNL-29896 ..... N82-13856 #
BNL-29900 ..... N82-13517 #

BR12597 ..... N82-13364 #

CCVS74-VSR780 ..... N82-13749 #
CCVS74-VSR805 ..... N82-13746 #
CCVS74-VSR815 ..... N82-13748* #

CEMEL-233 ..... N82-13724 #

CIVIL-ENGINEERING-STUDY-81-10 ... N82-13271 #

CM-51 ..... N82-13643 #

CN-ISSN-0082-5255 ..... N82-13151 #
CN-ISSN-0082-5255 ..... N82-13850 #

CONF-800205-16 ..... N82-13854 #
CONF-801111-50 ..... N82-13557 #
CONF-810151-1 ..... N82-13191 #
CONF-810367-2-REV-1 ..... N82-13408 #
CONF-810376-4 ..... N82-13825 #
CONF-810388-1 ..... N82-13365 #
CONF-810496-2 ..... N82-13858 #
CONF-810512 ..... N82-13909 #
CONF-810528-10 ..... N82-13951 #
CONF-810576-2 ..... N82-13861 #
CONF-810576-3 ..... N82-13394 #
CONF-810623-12 ..... N82-13424 #
CONF-810651-3 ..... N82-13407 #
CONF-810651-4 ..... N82-13954 #
CONF-810684-42 ..... N82-13224 #
CONF-810684-43 ..... N82-13422 #
CONF-810684-45 ..... N82-13857 #
CONF-810706-27 ..... N82-13743 #
CONF-810707-6 ..... N82-13860 #
CONF-810720-2 ..... N82-13952 #
CONF-810728-4 ..... N82-13818 #
CONF-810734-1 ..... N82-13516 #
CONF-810734-2 ..... N82-13194 #
CONF-810740-1 ..... N82-13855 #
CONF-810742-1 ..... N82-13473 #
CONF-810797-7 ..... N82-13366 #
CONF-810802-2 ..... N82-13522 #
CONF-810809-12 ..... N82-13950 #
CONF-810810-11 ..... N82-13889 #
CONF-810810-12 ..... N82-13925 #
CONF-810810-13 ..... N82-13885 #
CONF-810810-15 ..... N82-13890 #
CONF-810810-17 ..... N82-13225 #
CONF-810810-19 ..... N82-13888 #
CONF-810812-32 ..... N82-13523 #
CONF-810812-34 ..... N82-13392 #
CONF-810827-2 ..... N82-13190 #
CONF-810827-4 ..... N82-13423 #
CONF-810827-4 ..... N82-13955 #
CONF-810828-2 ..... N82-13948 #
CONF-810828-4 ..... N82-13223 #
CONF-810828-5 ..... N82-13953 #
CONF-810831-10 ..... N82-13222 #
CONF-810833-6 ..... N82-13521 #
CONF-810835-2 ..... N82-13517 #

CONF-810916-1 ..... N82-13393 #
CONF-810923-6 ..... N82-13244 #
CONF-810925-11 ..... N82-13264 #
CONF-810925-16 ..... N82-13524 #
CONF-810926-1 ..... N82-13250 #
CONF-810926-2 ..... N82-13251 #
CONF-810930-1 ..... N82-13774 #
CONF-810931-1 ..... N82-13454 #
CONF-8003144-1 ..... N82-13429 #
CONF-8007111-1 ..... N82-13556 #
CONF-8008122 ..... N82-13515 #
CONF-8009163 ..... N82-13226 #
CONF-8105104-3 ..... N82-13972 #
CONF-8105107-1 ..... N82-13263 #
CONF-8106100-4 ..... N82-13887 #
CONF-8106105-1 ..... N82-13836 #
CONF-8106106-1 ..... N82-13195 #
CONF-8106133-1 ..... N82-13452 #
CONF-8106139-2 ..... N82-13856 #
CONF-8106140-1 ..... N82-14032 #

COO-4169-6 ..... N82-13192 #

CORADCOM-78-2402-F ..... N82-13334 #

CRREL-SR-81-11 ..... N82-13597 #

CRREL-81-6 ..... N82-13471 #
CRREL-81-9 ..... N82-13472 #

CSCR-9 ..... N82-13664* #

CSD-TR-351 ..... N82-13735 #

CTH-MATH-1980-18 ..... N82-13798 #
CTH-MATH-1981-06 ..... N82-13802 #
CTH-MATH-1981-07 ..... N82-13803 #

CUED/A-THERMO/TR-5 ..... N82-13434 #

CUED/D-STRUCT/TR-87-1980 ..... N82-13458 #

DCEC-TN-9-81 ..... N82-13303 #
DCEC-TN-16-81 ..... N82-13769 #

DE81-023099 ..... N82-13923 #
DE81-023632 ..... N82-13193 #
DE81-024205 ..... N82-13246 #
DE81-024331 ..... N82-13926 #
DE81-025292 ..... N82-13950 #
DE81-025452 ..... N82-13191 #
DE81-025461 ..... N82-13773 #
DE81-025470 ..... N82-13885 #
DE81-025474 ..... N82-13249 #
DE81-025475 ..... N82-13247 #
DE81-025602 ..... N82-13429 #
DE81-025802 ..... N82-13422 #
DE81-025824 ..... N82-13407 #
DE81-025836 ..... N82-13251 #
DE81-025837 ..... N82-13250 #
DE81-026088 ..... N82-13652 #
DE81-026096 ..... N82-13856 #
DE81-026230 ..... N82-13195 #
DE81-026349 ..... N82-13952 #
DE81-026353 ..... N82-13860 #
DE81-026404 ..... N82-13983 #
DE81-026504 ..... N82-13190 #
DE81-026514 ..... N82-13194 #
DE81-026515 ..... N82-13516 #
DE81-026517 ..... N82-13556 #
DE81-026599 ..... N82-13889 #
DE81-026606 ..... N82-13365 #
DE81-026617 ..... N82-13949 #
DE81-026618 ..... N82-13836 #
DE81-026733 ..... N82-13859 #
DE81-026842 ..... N82-13451 #
DE81-027001 ..... N82-13424 #
DE81-027117 ..... N82-13855 #
DE81-027202 ..... N82-13366 #
DE81-027436 ..... N82-13955 #
DE81-027482 ..... N82-13520 #
DE81-027487 ..... N82-13971 #
DE81-027536 ..... N82-13526 #
DE81-027538 ..... N82-13525 #
DE81-027655 ..... N82-13818 #
DE81-027659 ..... N82-13948 #
DE81-027674 ..... N82-13873 #
DE81-027848 ..... N82-13951 #
DE81-027855 ..... N82-13152 #
DE81-027900 ..... N82-13647 #

DE81-027903 ..... N82-13452 #
DE81-027932 ..... N82-13978 #
DE81-027933 ..... N82-13771 #
DE81-027937 ..... N82-13264 #
DE81-027965 ..... N82-13192 #
DE81-028132 ..... N82-13972 #
DE81-028178 ..... N82-13558 #
DE81-028242 ..... N82-13886 #
DE81-028253 ..... N82-13862 #
DE81-028265 ..... N82-14048 #
DE81-028319 ..... N82-13474 #
DE81-028331 ..... N82-13517 #
DE81-028360 ..... N82-13772 #
DE81-028570 ..... N82-13523 #
DE81-028572 ..... N82-13953 #
DE81-028578 ..... N82-13222 #
DE81-028609 ..... N82-13392 #
DE81-028642 ..... N82-13244 #
DE81-028645 ..... N82-13408 #
DE81-028646 ..... N82-13888 #
DE81-028648 ..... N82-13887 #
DE81-028687 ..... N82-13857 #
DE81-028688 ..... N82-13854 #
DE81-028690 ..... N82-13225 #
DE81-028696 ..... N82-14032 #
DE81-028697 ..... N82-13521 #
DE81-028703 ..... N82-13263 #
DE81-028706 ..... N82-13774 #
DE81-028707 ..... N82-13394 #
DE81-028727 ..... N82-13924 #
DE81-028729 ..... N82-13454 #
DE81-028732 ..... N82-13423 #
DE81-028734 ..... N82-13473 #
DE81-028740 ..... N82-13890 #
DE81-028743 ..... N82-13224 #
DE81-028757 ..... N82-13858 #
DE81-028763 ..... N82-13954 #
DE81-028769 ..... N82-13743 #
DE81-028771 ..... N82-13223 #
DE81-028774 ..... N82-13861 #
DE81-028799 ..... N82-13925 #
DE81-028853 ..... N82-13825 #
DE81-028867 ..... N82-13522 #
DE81-028872 ..... N82-13524 #
DE81-029012 ..... N82-13557 #
DE81-029022 ..... N82-13853 #
DE81-029034 ..... N82-13872 #
DE81-029073 ..... N82-13265 #
DE81-029095 ..... N82-13245 #
DE81-029096 ..... N82-13871 #
DE81-029101 ..... N82-13977 #
DE81-029279 ..... N82-13453 #
DE81-029291 ..... N82-13518 #
DE81-029295 ..... N82-13531 #
DE81-029360 ..... N82-13519 #
DE81-029482 ..... N82-13248 #
DE81-029539 ..... N82-13534 #
DE81-029633 ..... N82-13540 #
DE81-030488 ..... N82-13198 #
DE81-030635 ..... N82-13909 #
DE81-030887 ..... N82-13539 #
DE81-030949 ..... N82-13562 #
DE81-030973 ..... N82-13197 #
DE81-031980 ..... N82-13863 #
DE81-032019 ..... N82-13565 #
DE81-903554 ..... N82-13226 #
DE81-903765 ..... N82-13515 #
DE82-000044 ..... N82-13542 #
DE82-000068 ..... N82-13533 #
DE82-000091 ..... N82-13367 #
DE82-000236 ..... N82-13538 #
DE82-000238 ..... N82-13541 #
DE82-000284 ..... N82-13196 #
DE82-000288 ..... N82-13252 #
DE82-000466 ..... N82-13544 #
DE82-000501 ..... N82-13536 #
DE82-000508 ..... N82-13560 #
DE82-000698 ..... N82-13566 #
DE82-000700 ..... N82-13527 #
DE82-000705 ..... N82-13535 #
DE82-000793 ..... N82-13368 #
DE82-000806 ..... N82-13775 #
DE82-000811 ..... N82-13532 #
DE82-000825 ..... N82-13956 #
DE82-000873 ..... N82-13475 #
DE82-000906 ..... N82-13395 #
DE82-000933 ..... N82-13409 #
DE82-000935 ..... N82-13567 #
DE82-000941 ..... N82-13530 #
DE82-000942 ..... N82-13529 #

DE82-000956 ..... N82-13627 #
DE82-000964 ..... N82-13543 #
DE82-000971 ..... N82-13561 #
DE82-001151 ..... N82-13528 #
DE82-900310 ..... N82-13570 #
DE82-900311 ..... N82-13569 #
DE82-900314 ..... N82-13568 #
DE82-900316 ..... N82-13559 #
DE82-900317 ..... N82-13564
DE82-900355 ..... N82-13563 #
DE82-900356 ..... N82-13537 #
DE82-900376 ..... N82-13431 #
DE82-900378 ..... N82-13430 #

DFVLR-FB-81-06 ..... N82-13837 #
DFVLR-FB-81-18 ..... N82-13119 #

DNA-5596F ..... N82-13220 #

DOE/BP-58 ..... N82-13519 #
DOE/BP-60 ..... N82-13518 #

DOE/CS-4042/2 ..... N82-13531 #
DOE/CS-303203/T5 ..... N82-13534 #

DOE/ER-01198/135 ..... N82-13949 #
DOE/ER-01198/1357 ..... N82-13836 #
DOE/ER-01545/309 ..... N82-13872 #
DOE/ER-04169/T1 ..... N82-13192 #
DOE/ER-04449/34 ..... N82-13859 #
DOE/ER-10759/1 ..... N82-13152 #
DOE/ER-10766/3 ..... N82-13647 #

DOE/ET-10204/T1 ..... N82-13248 #
DOE/ET-10785/T1 ..... N82-13926 #
DOE/ET-10815/55 ..... N82-13367 #
DOE/ET-12866/5 ..... N82-13525 #
DOE/ET-12866/8-VOL-1 ..... N82-13526 #
DOE/ET-20279/154 ..... N82-13533 #
DOE/ET-20356/3 ..... N82-13492* #
DOE/ET-29232/T4-VOL-2 ..... N82-13544 #
DOE/ET-29372/2 ..... N82-13493* #
DOE/ET-53051/25 ..... N82-13923 #

DOE/EV-02161/T1 ..... N82-13562 #
DOE/EV-10405/4 ..... N82-13557 #
DOE/EV-10414/T1 ..... N82-13475 #
DOE/EV-70001/60 ..... N82-13474 #

DOE/FE-20216/1 ..... N82-13247 #

DOE/JPL-1012-56 ..... N82-13494* #
DOE/JPL-1060-41 ..... N82-13495* #
DOE/JPL-954334/20 ..... N82-13498* #
DOE/JPL-954527-81/19 ..... N82-13503* #
DOE/JPL-954888-80/12 ..... N82-13500* #
DOE/JPL-955404-81/1 ..... N82-13502* #
DOE/JPL-955531-81/1 ..... N82-13171* #
DOE/JPL-955725-81/1 ..... N82-13501* #
DOE/JPL-955843-81/3 ..... N82-13497* #
DOE/JPL-955902-81/3 ..... N82-13496* #
DOE/JPL-955986-1 ..... N82-13499* #

DOE/MC-11284/1100 ..... N82-13198 #

DOE/METC/RI-188 ..... N82-13193 #

DOE/NASA-7307/1 ..... N82-13243* #

DOE/NASA/0083-1 ..... N82-13510* #
DOE/NASA/0125-1 ..... N82-13506* #
DOE/NASA/0161-9 ..... N82-13511* #
DOE/NASA/0203-1 ..... N82-13505* #
DOE/NASA/0241-1 ..... N82-13490* #
DOE/NASA/2593-24 ..... N82-13509* #
DOE/NASA/3230-1 ..... N82-13507* #
DOE/NASA/10769-23 ..... N82-13908* #
DOE/NASA/51040-34 ..... N82-13114* #

DOE/PC-30264/09 ..... N82-13196 #
DOE/PC-30302/3 ..... N82-13246 #

DOE/RA-50308/1 ..... N82-13252 #

DOE/S-00012 ..... N82-13539 #

DOE/SF-10538/T10 ..... N82-13983 #
DOE/SF-74016/T3 ..... N82-13451 #

DOT-HS-805814 ..... N82-13435 #
DOT-HS-805833 ..... N82-13985 #
DOT-HS-805873 ..... N82-13986 #
DOT-HS-805892 ..... N82-13987 #

DOT-TSC-NHTSA-81-6 ..... N82-13435 #
DOT-TSC-NHTSA-81-13 ..... N82-13985 #
DOT-TSC-NHTSA-81-17 ..... N82-13987 #
DOT-TSC-NHTSA-81-18 ..... N82-13986 #

DREO-TN-80-19 ..... N82-13156 #

DREV-R-4202/81 ..... N82-13421 #
DREV-R-4207/81 ..... N82-13420 #

DTNSRDC/CMLD-81/02 ..... N82-13741 #

E-648 ..... N82-13143* #
E-737 ..... N82-13509* #
E-1004 ..... N82-13144* #
E-1040 ..... N82-13504* #
E-1063 ..... N82-13112* #
E-1085 ..... N82-13113* #
E-1096 ..... N82-13146* #

EECS-TR-81-9 ..... N82-13740 #

EGG-CS-5351 ..... N82-13971 #

EMD-81-27 ..... N82-13255 #

ENST-E-80005 ..... N82-13891 #
ENST-E-80012 ..... N82-13776 #
ENST-E-80013 ..... N82-13892 #

EPA-560/13-79-018 ..... N82-13655 #
EPA-600/2-81-127 ..... N82-13575 #
EPA-600/2-81-150 ..... N82-13574 #
EPA-600/7-81-101 ..... N82-13576 #
EPA-600/7-81-133 ..... N82-13256 #
EPA-600/7-81-137 ..... N82-13270 #

EPRI-CS-1990 ..... N82-13430 #
EPRI-CS-2027 ..... N82-13431 #

EPRI-EA-1019-VOL-4 ..... N82-13569 #
EPRI-EA-1910-VOL-1 ..... N82-13568 #
EPRI-EA-1910-VOL-5 ..... N82-13570 #
EPRI-EA-1910-VOL-6 ..... N82-13563 #
EPRI-EA-1911 ..... N82-13564
EPRI-EA-2039 ..... N82-13559 #

EPRI-EM-2037 ..... N82-13537 #

EPRI-NP-1944 ..... N82-13884 #

EPRI-WS-80-136 ..... N82-13515 #
EPRI-WS-80-157 ..... N82-13226 #

ERC-TR-8101 ..... N82-13506* #

ERC-02-81 ..... N82-13476 #

ESA-CR(P)-1444 ..... N82-13780 #
ESA-CR(P)-1454 ..... N82-13370 #

ESD-SCFO-TR-6210 ..... N82-13733 #

ESL-7113553-2 ..... N82-13340 #

ESTEC/DERA-8/7208 ..... N82-13370 #

ETS-RR-81-20 ..... N82-13816 #

EUR-7086-EN ..... N82-13864 #
EUR-7099-EN ..... N82-13778 #

F-1066 ..... N82-13908* #

FCTC/TR-81/21 ..... N82-13747 #

FCVS78-VSR806 ..... N82-13745 #

FE-1545-89 ..... N82-13248 #

FHWA/CT-80/12 ..... N82-13267 #

FHWA/IN/JHRP-80/13 ..... N82-13268 #

FHWA/LA-81/129 ..... N82-13266 #
FHWA/LA-81/142 ..... N82-13269 #
FOA-A-30025-E4 ..... N82-13343 #

FOA-C-20380-T1 ..... N82-13604 #
FOA-C-20392-D8 ..... N82-13779 #
FOA-C-20393-D1 ..... N82-13397 #
FOA-C-20394-D3 ..... N82-13410 #
FOA-C-20411-D1 ..... N82-13254 #

FR-81-10/AS ..... N82-13220 #
FR-81-10071 ..... N82-13947 #

FSG-R-41 ..... N82-13644 #

FTD-ID(RS)T-0820-81 ..... N82-13307 #
FTD-ID(RS)T-0821-81 ..... N82-13311 #
FTD-ID(RS)T-0822-81 ..... N82-13323 #
FTD-ID(RS)T-0826-81 ..... N82-13327 #
FTD-ID(RS)T-0936-81 ..... N82-13294 #
FTD-ID(RS)T-0937-81 ..... N82-13318 #
FTD-ID(RS)T-0944-81 ..... N82-13297 #
FTD-ID(RS)T-0960-81 ..... N82-13304 #
FTD-ID(RS)T-2017-80 ..... N82-13139

FTD-81-C-000943 ..... N82-13307 #

GA-A-16272 ..... N82-13978 #
GA-A-16359 ..... N82-13771 #

GIT-ICS-81/02 ..... N82-13739 #
GIT-ICS-81/07 ..... N82-13742 #

HDL-CR-81-171-1 ..... N82-13388 #

HDL-SR-81-1 ..... N82-13513 #

HDL-TR-1961 ..... N82-13165 #

HEDL-SA-2236-FP ..... N82-13951 #

HIG-80-2 ..... N82-13599 #

IDA/HQ-81-29636 ..... N82-13136 #

IERL-RTP-1233 ..... N82-13270 #

ILR-50 ..... N82-13396 #

IPPJ-AM-18 ..... N82-13907 #

IPPJ-536 ..... N82-13903 #
IPPJ-540 ..... N82-14042 #
IPPJ-541 ..... N82-13904 #
IPPJ-542 ..... N82-13905 #
IPPJ-543 ..... N82-13906 #
IPPJ-544 ..... N82-13900 #
IPPJ-545 ..... N82-13901 #
IPPJ-546 ..... N82-13899 #
IPPJ-547 ..... N82-13902 #

IR-5 ..... N82-13141 #
IR-634-1 ..... N82-13765* #

IRT-8172-008 ..... N82-13167 #

IS-M-321 ..... N82-13191 #

ISBN-0-7988-1774-7 ..... N82-13273 #
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ISBN-92-835-0301-5 ..... N82-13065 #
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ISSN-0340-7608 ..... N82-13547 #

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ISSN-0357-7031 ..... N82-13456 #
ISSN-0374-1257 ..... N82-13118 #
ISSN-0531-4496 ..... N82-14028 #

ISWRRI-116 ..... N82-13479 #

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JPL-PUB-77-24-REV-1-ADD-1 ..... N82-13767*#
JPL-PUB-81-23 ..... N82-13495*#
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JPL-PUB-81-64 ..... N82-13494*#
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JPL-PUB-81-81 ..... N82-13300*#
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JPL-PUB-81-88 ..... N82-13766*#
JPL-PUB-81-89 ..... N82-13492*#
JPL-PUB-81-91 ..... N82-13491*#
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JPL-9950-603 ..... N82-13496*#
JPL-9950-605 ..... N82-13497*#
JPL-9950-606 ..... N82-13498*#
JPL-9950-608 ..... N82-13171*#
JPL-9950-609 ..... N82-13499*#
JPL-9950-610 ..... N82-13500*#
JPL-9950-611 ..... N82-13501*#
JPL-9950-612 ..... N82-13502*#
JPL-9950-613 ..... N82-13503*#

KSC-GP-15-23 ..... N82-13161*#

L-12993-VOL-1 ..... N82-13110*#
L-14591 ..... N82-13620*#
L-14674 ..... N82-13107*#
L-14679 ..... N82-13383*#
L-14703 ..... N82-13047*#
L-14714 ..... N82-13468*#
L-14756 ..... N82-13148*#
L-14776 ..... N82-13142*#
L-14782 ..... N82-13106*#
L-14848 ..... N82-13045*#

LA-UR-81-1421 ..... N82-13393 #
LA-UR-81-1664 ..... N82-13950 #
LA-UR-81-2052 ..... N82-13743 #
LA-UR-81-2082 ..... N82-13223 #
LA-UR-81-2124 ..... N82-13224 #
LA-UR-81-2137 ..... N82-13890 #
LA-UR-81-2141 ..... N82-13861 #
LA-UR-81-2192 ..... N82-13424 #
LA-UR-81-2193 ..... N82-13925 #
LA-UR-81-2257 ..... N82-13422 #
LA-UR-81-2263 ..... N82-13394 #
LA-UR-81-2265 ..... N82-13774 #
LA-UR-81-2283 ..... N82-13954 #
LA-UR-81-2288 ..... N82-13263 #
LA-UR-81-2307 ..... N82-13521 #
LA-UR-81-2320 ..... N82-14032 #
LA-UR-81-2343 ..... N82-13454 #
LA-UR-81-2367 ..... N82-13423 #
LA-UR-81-2380 ..... N82-13473 #

LA-77-1S-B ..... N82-13266 #
LA-80-1B-B ..... N82-13269 #
LA-8677-T ..... N82-13853 #
LA-8893-MS ..... N82-13886 #
LA-8932-PR ..... N82-13565 #

LBL-12288 ..... N82-13524 #
LBL-12893 ..... N82-13972 #
LBL-12924 ..... N82-13561 #
LBL-12961 ..... N82-13527 #
LBL-12981 ..... N82-13887 #

LC-81-600068 ..... N82-13744 #
LC-81-600070 ..... N82-13414 #

LIDS-TH-1115 ..... N82-13337 #

LOG-C4073 ..... N82-13111 #

LOG-G668 ..... N82-13160 #

LOG-J12276 ..... N82-13385 #
LOG-J12610 ..... N82-13790 #

LPI-CONTRIB-438 ..... N82-14040*#
LPI-CONTRIB-457 ..... N82-13595*#

M-365 ..... N82-13621*#

MC-IW-150/80 ..... N82-13799 #

MDC-G9915 ..... N82-13764*#

MHSMP-81-34 ..... N82-13249 #

MIT/LCS/TR-261 ..... N82-13797 #

MPIS-MITT-69 ..... N82-13118 #

MRC-TSR-2246 ..... N82-13792 #
MRC-TSR-2251 ..... N82-13791 #

NAL-TR-321T ..... N82-13109 #

NASA-CASE-GSC-12032-2 ..... N82-13465*

NASA-CASE-LAR-12592-1 ..... N82-13415*

NASA-CASE-MFS-25139-1 ..... N82-13376*

NASA-CP-2184-VOL-2 ..... N82-13123*#

NASA-CR-3480 ..... N82-13621*#
NASA-CR-3482 ..... N82-13147*#
NASA-CR-161884 ..... N82-13154*#
NASA-CR-161913 ..... N82-13764*#
NASA-CR-161915 ..... N82-13765*#
NASA-CR-161916 ..... N82-13428*#
NASA-CR-164935 ..... N82-13596*#
NASA-CR-165004 ..... N82-14039*#
NASA-CR-165005 ..... N82-13665*#
NASA-CR-165006 ..... N82-13989*
NASA-CR-165007 ..... N82-13502*#
NASA-CR-165008 ..... N82-13828*#
NASA-CR-165009 ..... N82-13766*#
NASA-CR-165010 ..... N82-13981*#
NASA-CR-165011 ..... N82-13186*#
NASA-CR-165012 ..... N82-13768*#
NASA-CR-165013 ..... N82-13497*#
NASA-CR-165014 ..... N82-13496*#
NASA-CR-165015 ..... N82-13493*#
NASA-CR-165016 ..... N82-13171*#
NASA-CR-165017 ..... N82-13495*#
NASA-CR-165019 ..... N82-13492*#
NASA-CR-165020 ..... N82-13301*#
NASA-CR-165021 ..... N82-13491*#
NASA-CR-165022 ..... N82-13498*#
NASA-CR-165025 ..... N82-13767*#
NASA-CR-165027 ..... N82-13300*#
NASA-CR-165029 ..... N82-13217*#
NASA-CR-165030 ..... N82-13500*#
NASA-CR-165031 ..... N82-13503*#
NASA-CR-165032 ..... N82-13501*#
NASA-CR-165033 ..... N82-13499*#
NASA-CR-165034 ..... N82-13595*#
NASA-CR-165036 ..... N82-13150*#
NASA-CR-165039 ..... N82-14027*#
NASA-CR-165219 ..... N82-13427*#
NASA-CR-165264 ..... N82-13554*#
NASA-CR-165324 ..... N82-13507*#
NASA-CR-165328 ..... N82-13490*#
NASA-CR-165396 ..... N82-13510*#
NASA-CR-165403 ..... N82-13505*#
NASA-CR-165413 ..... N82-13357*#
NASA-CR-165424 ..... N82-13508*#
NASA-CR-165462 ..... N82-13511*#
NASA-CR-165467 ..... N82-13302*#
NASA-CR-165480 ..... N82-13506*#
NASA-CR-165515 ..... N82-13145*#
NASA-CR-165517 ..... N82-13243*#
NASA-CR-165799 ..... N82-13356*#
NASA-CR-166243-VOL-1 ..... N82-13662*#
NASA-CR-166243-VOL-2 ..... N82-13663*#
NASA-CR-166259 ..... N82-13664*#
NASA-CR-166272 ..... N82-13622*#
NASA-CR-166273 ..... N82-13046*#
NASA-CR-166719 ..... N82-13470*#

NASA-RP-1081 ..... N82-13592*#

NASA-SP-7037(140) N82-13044*

NASA-TM-80097 ..... N82-13110*#
NASA-TM-81332 ..... N82-13637*#
NASA-TM-81366 ..... N82-13149*#
NASA-TM-81367 ..... N82-14047*#
NASA-TM-81708 ..... N82-13509*#
NASA-TM-81972 ..... N82-13148*#
NASA-TM-82169 ..... N82-13469*#
NASA-TM-82450 ..... N82-13851*#
NASA-TM-82451 ..... N82-13218*#
NASA-TM-82452 ..... N82-13216*#
NASA-TM-82726 ..... N82-13114*#
NASA-TM-82731 ..... N82-13504*#
NASA-TM-82747 ..... N82-13112*#
NASA-TM-82750 ..... N82-13908*#
NASA-TM-82764 ..... N82-13113*#
NASA-TM-82770 ..... N82-13144*#
NASA-TM-82771 ..... N82-13146*#
NASA-TM-83198 ..... N82-13045*#
NASA-TM-83208 ..... N82-13047*#
NASA-TM-83846 ..... N82-14038*#
NASA-TM-83849 ..... N82-13593*#
NASA-TM-83850 ..... N82-13594*#
NASA-TM-83855 ..... N82-13623*#
NASA-TM-83856 ..... N82-14037*#
NASA-TM-84061 ..... N82-13827*#
NASA-TM-84065 ..... N82-14040*#
NASA-TM-84067 ..... N82-13140*#
NASA-TM-84068 ..... N82-13161*#
NASA-TM-84072 ..... N82-13162*#
NASA-TM-84211 ..... N82-14041*#
NASA-TM-84413 ..... N82-13877*#
NASA-TM-84414 ..... N82-13876*#

NASA-TP-1798 ..... N82-13143*#
NASA-TP-1924 ..... N82-13620*#
NASA-TP-1926 ..... N82-13107*#
NASA-TP-1928 ..... N82-13383*#
NASA-TP-1940 ..... N82-13142*#
NASA-TP-1941 ..... N82-13468*#
NASA-TP-1951 ..... N82-13108*#
NASA-TP-1952 ..... N82-13106*#

NATICK-TR-81/026 ..... N82-13724 #

NBDL-M004 ..... N82-13650 #

NBS-SP-500-78 ..... N82-13744 #
NBS-SP-613 ..... N82-13414 #

NBSIR-81-1645 ..... N82-13928 #
NBSIR-81-2292 ..... N82-13272 #
NBSIR-81-2300 ..... N82-13549 #
NBSIR-81-2308 ..... N82-13399 #
NBSIR-81-2310 ..... N82-13988 #

NEAR-TR-221 ..... N82-13046*#

NOAA-NWS-TM-PR-23 ..... N82-13634 #

NOAA-TM-ERL-ARL-100 ..... N82-13635 #

NOAA-TM-ERL-NSSL-91 ..... N82-13628 #

NOAA-TM-ERL-OWRM-2 ..... N82-13572 #
NOAA-TM-ERL-OWRM-3 ..... N82-13573 #

NOAA-TM-NOS-NGS-32 ..... N82-13606 #

NOAA-TM-NWS-FCST-25 ..... N82-13632 #

NOAA-TM-NWS-WR-165 ..... N82-13636 #

NOAA-81050601-SUPPL ..... N82-14046 #
NOAA-81050602-PT-1 ..... N82-14044 #
NOAA-81050603-PT-2 ..... N82-14045 #
NOAA-81052001 ..... N82-13644 #
NOAA-81052103 ..... N82-13484 #
NOAA-81052107 ..... N82-13607 #
NOAA-81052901 ..... N82-13628 #
NOAA-81052903 ..... N82-13636 #
NOAA-81052910-PT-3 ..... N82-13633 #
NOAA-81062603 ..... N82-13606 #
NOAA-81062605 ..... N82-13632 #
NOAA-81062606 ..... N82-13634 #
NOAA-81062607 ..... N82-13635 #
NOAA-81062608 ..... N82-13572 #
NOAA-81062609 ..... N82-13573 #
NOAA-81062615 ..... N82-13631 #

NOO-RP-32C ..... N82-13641 #

NOO-TR-271 ..... N82-13834 #

NOSC/TD-448 ..... N82-13438 #

NOSC/TR-686 ..... N82-13737 #

NPS-012-81-002PR ..... N82-13974 #
NPS-012-81-003PR ..... N82-13975 #

NRC/CNR-TT-2004 ..... N82-13170 #

NRL-MR-4548 ..... N82-13852 #
NRL-MR-4616 ..... N82-13261 #
NRL-MR-4649 ..... N82-13602 #

NR80H-50 ..... N82-13835 #

NSWC/TR-80-229 ..... N82-13449 #
NSWC/TR-80-441 ..... N82-13358 #
NSWC/TR-80-497 ..... N82-13361 #

NTIA/REPT-81/75 ..... N82-13157 #

NYSERDA-81-8 ..... N82-13368 #

O-491-203-81-03 ..... N82-13162* #

ONERA-NT-1981-1 ..... N82-13398 #

ONR-TR-81-4 ..... N82-13795 #
ONR-TR-81-7 ..... N82-13794 #

ORAU-185 ..... N82-13538 #

ORAU/IEA-81-6(M) ..... N82-13558 #

ORNL-5750 ..... N82-13652 #
ORNL-5753 ..... N82-13671 #
ORNL-5784 ..... N82-13536 #

ORNL/RSIC-45 ..... N82-13863 #

ORNL/SUB-81-92304/1 ..... N82-13771 #

ORNL/TM-7787 ..... N82-13560 #
ORNL/TM-7805 ..... N82-13977 #
ORNL/TM-7882 ..... N82-13873 #
ORNL/TM-7915 ..... N82-13245 #

P-A826 ..... N82-13470* #

PB81-221178 ..... N82-14044 #
PB81-221186 ..... N82-14045 #
PB81-221194 ..... N82-14046 #
PB81-222507 ..... N82-13928 #
PB81-223034 ..... N82-13273 #
PB81-223455 ..... N82-13414 #
PB81-225732 ..... N82-13607 #
PB81-226151 ..... N82-13575 #
PB81-226417 ..... N82-13749 #
PB81-227126 ..... N82-13485 #
PB81-227365 ..... N82-13227 #
PB81-227753 ..... N82-13484 #
PB81-227779 ..... N82-13644 #
PB81-227787 ..... N82-13958 #
PB81-227878 ..... N82-13272 #
PB81-227886 ..... N82-13549 #
PB81-228488 ..... N82-13255 #
PB81-228751 ..... N82-13481 #
PB81-228892 ..... N82-13748* #
PB81-229163 ..... N82-13988 #
PB81-229189 ..... N82-13399 #
PB81-230336 ..... N82-13636 #
PB81-230427 ..... N82-13572 #
PB81-230443 ..... N82-13635 #
PB81-230492 ..... N82-13634 #
PB81-231185 ..... N82-13413 #
PB81-231417 ..... N82-13268 #
PB81-231441 ..... N82-13412 #
PB81-231458 ..... N82-13483 #
PB81-231482 ..... N82-13633 #
PB81-231615 ..... N82-13269 #
PB81-231698 ..... N82-13576 #
PB81-231714 ..... N82-13632 #
PB81-231904 ..... N82-13476 #
PB81-231912 ..... N82-13478 #
PB81-231920 ..... N82-13477 #
PB81-231938 ..... N82-13479 #
PB81-231961 ..... N82-13480 #
PB81-232019 ..... N82-13157 #
PB81-232415 ..... N82-13747 #
PB81-232423 ..... N82-13746 #
PB81-232431 ..... N82-13745 #
PB81-232464 ..... N82-13458 #
PB81-232480 ..... N82-13434 #
PB81-232738 ..... N82-13271 #
PB81-232761 ..... N82-13266 #
PB81-232811 ..... N82-13655 #
PB81-233025 ..... N82-13435 #
PB81-233298 ..... N82-13985 #
PB81-233306 ..... N82-13489 #
PB81-233314 ..... N82-13199 #
PB81-233355 ..... N82-13631 #
PB81-233553 ..... N82-13267 #
PB81-233850 ..... N82-13986 #
PB81-233884 ..... N82-13984 #
PB81-233918 ..... N82-13488 #
PB81-234114 ..... N82-13573 #
PB81-234239 ..... N82-13256 #
PB81-234338 ..... N82-13606 #
PB81-234452 ..... N82-13630 #
PB81-234494 ..... N82-13629 #
PB81-234502 ..... N82-13487 #
PB81-234882 ..... N82-13482 #
PB81-234940 ..... N82-13628 #
PB81-235756 ..... N82-13987 #
PB81-237869 ..... N82-13744 #
PB81-238248 ..... N82-13486 #
PB81-239311 ..... N82-13574 #
PB81-242513 ..... N82-13270 #

PDE-208 ..... N82-13249 #

PNL-3592 ..... N82-13409 #
PNL-3864 ..... N82-13627 #
PNL-3933 ..... N82-13535 #
PNL-4013 ..... N82-13567 #
PNL-4018 ..... N82-13566 #

PPI-3009-4 ..... N82-13505* #

PPPL-1822 ..... N82-13924 #

PR-2 ..... N82-13881 #

PTR-81-12 ..... N82-13828* #
PTR-1092-81-6 ..... N82-13817 #

PUB-122 ..... N82-13480 #

PWA-5736-17 ..... N82-13145* #

QPR-3 ..... N82-13647 #

QR-1 ..... N82-13490* #
QR-3 ..... N82-13496* #

QTPR-3 ..... N82-13196 #
QTPR-3 ..... N82-13246 #

QTR-1 ..... N82-13499* #

RADC-TR-81-41 ..... N82-13336 #
RADC-TR-81-42 ..... N82-13339 #
RADC-TR-81-91 ..... N82-13340 #
RADC-TR-81-113 ..... N82-13359 #
RADC-TR-81-127 ..... N82-13739 #
RADC-TR-81-155 ..... N82-13364 #
RADC-TR-81-196 ..... N82-13878 #
RADC-TR-81-198 ..... N82-13167 #

RAND/P-6655 ..... N82-13980 #

RAND/R-2601-AF ..... N82-13979 #

RDA-TR-107605-001 ..... N82-13391 #

REPT-13 ..... N82-13435 #
REPT-41 ..... N82-13644 #
REPT-81-9D1-MARED-R1 ..... N82-13511* #
REPT-81-131 ..... N82-13927 #
REPT-134 ..... N82-14027* #
REPT-550.388.8 ..... N82-13591 #
REPT-646-1-80-12 ..... N82-13267 #
REPT-0690-005A ..... N82-13976 #
REPT-15521.6-C ..... N82-13187 #

RFP-3228 ..... N82-13195 #

RR-614.71 ..... N82-13553 #

SACLANTCEN-SM-150-VOL-1 ..... N82-13639 #

SACLANTCEN-SR-47 ..... N82-13640 #

SAI-EF79-56 ..... N82-13622* #

SAI-81-260-WA ..... N82-13834 #

SAND-81-0245C ..... N82-13250 #
SAND-81-0246C ..... N82-13251 #
SAND-81-0365C ..... N82-13190 #
SAND-81-0463 ..... N82-13775 #
SAND-81-0727C ..... N82-13888 #
SAND-81-0728C ..... N82-13885 #
SAND-81-1139C ..... N82-13452 #
SAND-81-1578C-PT-2 ..... N82-13365 #
SAND-81-1612 ..... N82-13453 #
SAND-81-1680C ..... N82-13366 #
SAND-81-1950 ..... N82-13956 #
SAND-81-7088-2 ..... N82-13532 #
SAND-81-7123 ..... N82-13520 #
SAND-81-8220 ..... N82-13529 #
SAND-81-8232 ..... N82-13530 #

SANL-905-002 ..... N82-13249 #

SAPR-16 ..... N82-14039* #

SAR-3 ..... N82-13217* #

SCI-ICS-L-81-5 ..... N82-13770 #

SC5211.2AR ..... N82-13221 #
SC5248.12FR ..... N82-13219 #

SD-TR-81-25 ..... N82-13600 #
SD-TR-81-37 ..... N82-13946 #
SD-TR-81-59 ..... N82-13601 #

SERI/PR-8136-1-T5 ..... N82-13540 #

SERI/TP-1316 ..... N82-13264 #

SERI/TR-721-1119 ..... N82-13265 #
SERI/TR-721-1161 ..... N82-13528 #
SERI/TR-8142-4-T3 ..... N82-13197 #
SERI/TR-98020-1 ..... N82-13542 #
SERI/TR-98356-1 ..... N82-13541 #

SGD-438-SUPPL ..... N82-14046 #
SGD-439-PT-1 ..... N82-14044 #
SGD-439-PT-2 ..... N82-14045 #

SGI-R-80-034 ..... N82-13598 #

SLAC-PUB-2747 ..... N82-13858 #

SP-RAPP-1979/4 ..... N82-13548 #

T-441 ..... N82-13796 #

TOP-4-2-822 ..... N82-13389 #
TOP-6-2-570 ..... N82-13338 #

TR-6 ..... N82-13736 #
TR-25 ..... N82-13591 #
TR-81-C-29 ..... N82-13114* #
TR-81-1 ..... N82-13820 #
TR-81-20 ..... N82-13734 #
TR-205 ..... N82-13815 #
TR-214 ..... N82-13821 #
TR-341 ..... N82-13795 #
TR-347 ..... N82-13794 #
TR-376-16 ..... N82-13508* #
TR-973 ..... N82-13738 #
TR-0081(6930-02)-1 ..... N82-13946 #
TR-0081(6960-05)-2 ..... N82-13601 #
TR-0081(6960-05)-8 ..... N82-13600 #

TRITA-NA-8104 ..... N82-13800 #
TRITA-NA-8105-PT-1 ..... N82-13801 #

TSR-3 ..... N82-13534 #

UAL-C-80-31-33 ..... N82-13554* #

UCID-19085 ..... N82-13773 #
UCID-19086 ..... N82-13862 #
UCID-19156 ..... N82-13772 #
UCID-19199 ..... N82-13543 #

UCRL-52000-81-7 ..... N82-14048 #
UCRL-52972 ..... N82-13395 #
UCRL-83050 ..... N82-13854 #
UCRL-85609 ..... N82-13889 #
UCRL-85684 ..... N82-13407 #
UCRL-85730-REV-1 ..... N82-13408 #
UCRL-85778 ..... N82-13818 #
UCRL-85818 ..... N82-13429 #
UCRL-85919 ..... N82-13244 #
UCRL-86484 ..... N82-13948 #
UCRL-86485 ..... N82-13955 #
UCRL-86489 ..... N82-13857 #
UCRL-86514 ..... N82-13225 #

UDR-TR-80-107 ..... N82-13448 #

US-PATENT-APPL-SN-041141 ..... N82-13415*
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US-PATENT-APPL-SN-578700 ..... N82-13465*
US-PATENT-APPL-SN-583219 ..... N82-13465*

US-PATENT-CLASS-239-499 ..... N82-13376*
US-PATENT-CLASS-239-589 ..... N82-13376*
US-PATENT-CLASS-239-601 ..... N82-13376*
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US-PATENT-CLASS-250-236 ..... N82-13465*
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US-PATENT-CLASS-331-94.5P N82-13415*
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US-PATENT-4,300,108 ..... N82-13415*
US-PATENT-4,300,159 ..... N82-13465*
US-PATENT-4,300,723 ..... N82-13376*

USCG-D-06-81 ..... N82-13512 #

USGS/WRD-WRI-81-069 ..... N82-13481 #

USGS/WRI-80-47 ..... N82-13481 #

UTIAS-250 ..... N82-13151 #
UTIAS-251 ..... N82-13850 #

UTMA-IT-09-00890-81-1 ..... N82-13984 #

UTRC/R81-955200-4 ..... N82-13390 #

VPI-E-81-19 ..... N82-13958 #

VTT-11 ..... N82-13456 #

WAED-81-05E ..... N82-13357* #

WES-INSTRUCTION-K-81-6 ..... N82-13262 #

WRRC-24 ..... N82-13482 #

W81-04311 ..... N82-13476 #
W81-04313 ..... N82-13478 #
W81-04315 ..... N82-13479 #
W81-04318 ..... N82-13480 #

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